Mackenzie Mountain Non-resident and Non-resident Alien Hunter Harvest Summary 2011

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ABSTRACT

Each of the eight licenced outfitters and Renewable Resource Officers with the Sahtu and Dehcho Environment and Natural Resources (ENR) Regional offices collected data on big game harvested in the Mackenzie Mountains during the 2011 hunting season. Harvest data and observations of wildlife from non-resident and non-resident alien hunters (collectively called 'non-resident' for this report) were recorded. For 2011, 396 hunters bought non-resident licences. This is higher than the average 363 (range 321-407) sold to non-resident hunters from 1991-2011. Hunters purchased the second greatest number of wolf and wolverine tags since records started in 1995. Hunters (n=304) from outside Canada (non-resident aliens) were primarily from the USA (n=242) and comprised 61% of the outfitted hunters; 14, 8, and 8 hunters were from Germany, Mexico, and Belgium respectively. There were 92 (23%) Canadian hunters, whose residency was from outside the Northwest Territories (NT). Of the 396 non-resident licence holders, 352 came to the NT and most spent at least some time hunting. Two-hundred and fifty-one tags were purchased for Dall's sheep; 181 rams were harvested (including six by resident hunters). The average annual ram harvest over the past 21 years is 197. The mean (±SD) age of harvested rams was 10.8 $\pm$ 1.7 years, the second highest average age since records have been kept (1967), and the 24th consecutive year the average age of harvested rams from the Mackenzie Mountains has been ≥9.5 years. The average right horn length was 90.5 cm. Hunters reported seeing more legal rams (horns at least ¾ curl) than rams with horns < ¾ curl during their hunts, average eight legal rams/hunt. Based upon hunter observations we estimated 55.8 lambs and 91.4 rams per 100 ewes, respectively. In 2011, more tags were purchased for northern mountain caribou (n=314) than in any year since reporting started in 1991. The harvest of 181 bull caribou was higher than the average of 157

(range 117-191) from the past 21 years. Hunters observed an estimated 44.0 caribou calves, and 35.3 bulls per 100 adult female caribou, respectively. More tags were purchased for moose in 2011 (n=121) than in the previous 21 years. The harvest of 78 bull moose in 2011 is the greatest since reporting started in 1991. Hunters observed an estimated 33.0 moose calves, and 123.1 bulls per 100 adult female moose, respectively. The number of calves per 100 adult females is higher than the average 30:100 recorded since 1995 and the eleventh time in the past 17 years when the ratio has been ≥30:100. More tags were purchased in 2011 for mountain goats (n=55) than in the previous 21 years. Twenty goats harvested (18 billies and two nannies) a similar harvest to that reported from 2007-2009. The mean age, determined by horn annuli of 16 harvested goats, was 6.4 years (range 2.5-11.5 years); two goats were >10 years old. Hunters observed an estimated 64.2 goat kids and 59.4 billies per 100 adult nannies. Twenty-one wolves were harvested from 285 tags purchased, including two harvested during hunts in April 2012, a time outside of the usual hunting season in the mountains. During 1991-2011 mean annual wolf harvest was 15 (range 7-23). Hunters observed 184 wolves in 2011 (range 142-317 observed 1995-2010). Two wolverines were harvested from 163 tags purchased in 2011. Hunters observed 30 wolverines in total including observations of two and three animal groups. The number of wolverine observed in 2011 is similar to 2010, up from a low in 2007, and similar to the numbers observed during 1995-1999 and 2004-2006. A single black bear was harvested from 32 tags purchased. Only four black bears have been harvested in the Mackenzie Mountains since 1991. There has been no grizzly bear hunting season for non-residents since 1982. Three nuisance grizzly bears were killed this year. Hunter satisfaction remains high; 96% of respondents (n=210) rated their experience as either excellent (90%) or very good (6%). A number of hunters made specific comments

about the high quality hunting experience, the abundance of wildlife in the Mackenzie Mountains (both game and predators), and the impressive management and stewardship of the land; 24% were repeat clients returning for a (range 2nd to 20th) hunt in the Mackenzie Mountains, and 95% indicated they would like to return in future years. Disappointingly, we received only 62% of the voluntary hunter observation forms, returning to pre-2004 levels. However, the new reporting system we designed with the Association of Mackenzie Mountain Outfitters (AMMO) for summarizing wild game meat records has worked extremely well. This year we were able to summarize information about meat distribution for all eight outfitters. We estimated that at least 24,750 kg (54,450 pounds) of wild game meat, mostly moose and mountain caribou, was distributed locally in 2011. Replacement cost of meat from local northern retailers is estimated conservatively at $618,750, using $25/kg average replacement cost. We will continue with this reporting system in future. The boundaries of Nahanni National Park Reserve were substantially expanded in 2009. For a third year there were comments questioning the size of the Nahanni National Park Reserve expansion. The new boundary overlaps outfitting zones Ramhead, South Nahanni, and Nahanni Butte by 4.7%, 27.2% and 79.4% of the total area respectively. However, until negotiations between these outfitters and Parks Canada are completed ENR will continue to issue licences, tags, and export permits for harvesting by these three outfitters in their zones.

In Memorium

GNWT – ENR Sahtu Region

It is with great sadness that we report the passing of Anise Mary Knox aka: Wildlife Guardian – Licence Clerk.

December 12, 1950 – November 07, 2011

Our most sincere condolences to her family, particularly her daughters Michele and Laura. Fondly remembered and sorely missed, this lady was truly one of a kind.

Born Anise Mary Sibley in Calgary AB, the third of five children in an Army family, moving around, and making new friends was part of her lifestyle. Mary worked several places before landing at ENR. For many years she was known as the 'sucker lady' at the local gas station, then later at the travel agent's and the bank.

Because Mary liked people, she brought the office to life every day with her humour and wit. On her desk sat an assortment of "toys" she collected and always some type of candy could be found. Anyone who paid a visit to the Environment and Natural Resources Sahtu Regional Office in Norman Wells since 2005, be they woodcutters, trappers, hunters, fishermen, outfitters, guides, or tourists who called for information or obtained a licence would most likely have met or spoke to Mary and likely got candy too.

Mary was like a mother hen watching over the officers and staff, making sure they got where they were supposed to and keeping track of them like her brood. Always ready with a snack, Mary made sure no one went underfed. When office discussions got out of hand Mary was most often the voice of reason, but sometimes she could be the instigator of a good joke. Mary always came to work with a cheerful disposition no matter how she was feeling herself; it was a surprise to learn she had cancer. Sadly, Mary lost her short but hard fought battle; she is truly missed by all.

TABLE OF CONTENTS

ABSTRACT ii

IN MEMORIUM v

LIST OF FIGURES viii

LIST OF TABLES ix

INTRODUCTION 1

- General Background 1
- Nahanni National Park Reserve Expansion 9
- Share Site Agreement of Outfitting Zone 11

METHODS 12

RESULTS and DISCUSSION 14

- Hunters 14
- Dall's Sheep *(Ovis dalli)* 20
- Northern Mountain Caribou (*Rangifer tarandus caribou*) 30
- Moose (*Alces americanus*) 35
- Mountain Goat (*Oreamnos americanus*) 40
- Wolf (*Canis lupus*) 44
- Wolverine (*Gulo gulo*) 46
- Black Bear (*Ursus americanus*) 48
- Grizzly Bear (*Ursus arctos*) 50

ACKNOWLEDGMENTS 54

PERSONAL COMMUNICATIONS 55

LITERATURE CITED 56

APPENDIX A. Outfitters licenced to provide services to non-resident hunters in the Mackenzie Mountains, NT - 2011 61

APPENDIX B. Summary of fees, bag limits, and seasons for big game species available to non-resident hunters in the Mackenzie Mountains, NT – 2011 62

APPENDIX C. Comments provided from non-resident hunters in the Mackenzie Mountains, NT on voluntary Hunter Wildlife Observation Report forms, 2011 63

APPENDIX D. A summary of the 2011 voluntary hunter comments broken down into specific topics 67

APPENDIX E. Number, age, and horn length measurements of Dall's sheep rams harvested by non-resident hunters in the Mackenzie Mountains, 1967-2011 68

APPENDIX F. Outfitted non-resident hunter harvests in the Mackenzie Mountains, 1991-2011 70

APPENDIX G. Summary of age and sex ratios calculated from non-resident hunter observation reports in the Mackenzie Mountains, 1995-2011 71

APPENDIX H. Summary of age and sex ratios calculated from non-resident hunter observation reports of mountain goats, 2002-2011 72

LIST OF FIGURES

FIGURE 1. Outfitting zones and land claim areas (dotted lines) of the Mackenzie Mountains, Northwest Territories, with Nahanni National Park Reserve (NNPR) original boundary indicated. 2

FIGURE 2. The original boundary of NNPR, in white, with the newly expanded boundary..... 3

FIGURE 3 Example of a completed outfitter return on client hunter success form 7

FIGURE 4. Example of fully completed hunter observation report form. 8

FIGURE 5. The number of Dall's sheep, mountain caribou, and moose harvested in the Mackenzie Mountains by non-resident hunters, and the number of non-resident licences sold during 1991-2011 16

FIGURE 6. The geographical areas of origin of hunters purchasing licences (in percent) to hunt in the Mackenzie Mountains from 2002-2011 16

FIGURE 7. The relationship between the horn length (cm) and age (based upon horn annuli) of 104 mountain goats harvested in the Mackenzie Mountains 2005-2011..... 44

FIGURE 8. The number of wolverine observed by hunters from 1995-2011, and the outfitter zones where the observations occurred 47

FIGURE 9. The number of cubs/100 adults and the total number of adult grizzly bears observed by hunters from 1996-2011. 52

LIST OF TABLES

TABLE 1. The area (km²) and percent of the outfitting zones that lie within the 2009 expanded boundary of Nahanni National Park Reserve 10

TABLE 2. The areas (km^2) and percent of each outfitting zone that fall within different land claim areas. 11

TABLE 3. Province state and/or country of origin of licenced non-resident hunters in the Mackenzie Mountains, 2011 15

TABLE 4. Percent of Mackenzie Mountain outfitter and non-resident hunter forms submitted, 1995-2011 15

TABLE 5. Satisfaction ratings for non-resident hunters (including non-hunting guides) in the Mackenzie Mountains, 1996-2011 18

TABLE 6. Tags for big game species purchased by non-resident hunters with outfitters in the Mackenzie Mountains, 1995-2011 22

TABLE 7. Mean length, standard deviation, and range (in days) of Dall's sheep hunts where at least one day was spent hunting from 1997-2011 23

TABLE 8. Measurements of Dall's sheep ram horns from sheep harvested by non-resident hunters in the Mackenzie Mountains, 2011 23

TABLE 9. Age-structure of Dall's sheep rams harvested by non-resident and resident (n=6) hunters in the Mackenzie Mountains, 1995-2011, based upon counting horn annuli 25

TABLE 10. Observations of Dall's sheep reported by non-resident hunters in the Mackenzie Mountains, 2011 27

TABLE 11. Classification of Dall's sheep rams observed by non-resident hunters in the Mackenzie Mountains, 1995-2011 29

TABLE 12. Mean length, standard deviation, and range (in days) of mountain caribou hunts where at least one day was spent hunting from 2000-2011 31

TABLE 13. Observations of mountain caribou reported by non-resident hunters in the Mackenzie Mountains, 2011 31

TABLE 14. Antler measurements of mountain caribou bulls harvested by non-resident hunters in the Mackenzie Mountains, 2011 32

TABLE 15. Mean length, standard deviation, and range (in days) of moose hunts where at least one day was spent hunting from 2000-2011 37

TABLE 16. The yearly mean and range of measured bull moose tip-to-tip antler spread (cm).....38

TABLE 17. Observations of moose reported by non-resident hunters in the Mackenzie Mountains, 2011 40

TABLE 18. Mean length, standard deviation, and range (in days) of goat hunts where at least one day was spent hunting from 2000-2011.....41

TABLE 19. Observations of wolves reported by non-resident hunters in the Mackenzie Mountains, the number of wolves harvested and the number of wolf tags purchased 1995-2011 46

TABLE 20. The number of reported observations of wolverines, the number of wolverines harvested, the number of hunters with wolverine tags, the percentage of total hunters with wolverine tags, and the total number of hunting licences purchased for 1995-2011 48

TABLE 21. Observations of black bear reported by non-resident hunters (including non-hunting guides) in the Mackenzie Mountains, 1995-2011.....49

TABLE 22. Observations of grizzly bear reported by non-resident hunters in the Mackenzie Mountains, 1995-2011 53

INTRODUCTION

General Background

The 140,000 km^2 (54,000 mi^2; 34.6 million acres) area of the Mackenzie Mountains in the western Northwest Territories (NT) was first opened to non-subsistence hunters in 1965 (Simmons 1968). Since then, the Mackenzie Mountains have become world-renowned for providing a high quality wilderness hunting experience, (www.spectacularnwt.com/whattodo/hunting/themackenziemountains; Veitch and Simmons 1999), particularly for Dall's sheep. In return, non-resident hunters and outfitters in the Mackenzie Mountains provide about $2.5 million annually to individuals, businesses, and governments in the NT (Harold Grinde, personal communication). The outfitted hunting industry in the Mackenzie Mountains also provides employment for 150 to 170 outfitters, guides, pilots, camp cooks, camp helpers, and horse wranglers (Werner Aschbacher, personal communication). In addition, fresh meat from many harvested animals is provided to a number of local communities including Tulita, Fort Good Hope, and Norman Wells in the Sahtu and Wrigley, Nahanni Butte, Fort Liard and Fort Simpson in the Dehcho. This meat is distributed among local elders and residents and to health/long term care facilities. The estimated annual replacement value of this meat has ranged from *ca.* $60,000 - $615,000.

Eight outfitters are currently licenced by the Government of the Northwest Territories (GNWT) to provide big game outfitting services within the Mackenzie Mountains (Figure 1; Appendix A). No hunting is permitted within the original boundaries of Nahanni National Park Reserve (Figures 1 and 2), except for subsistence harvest by

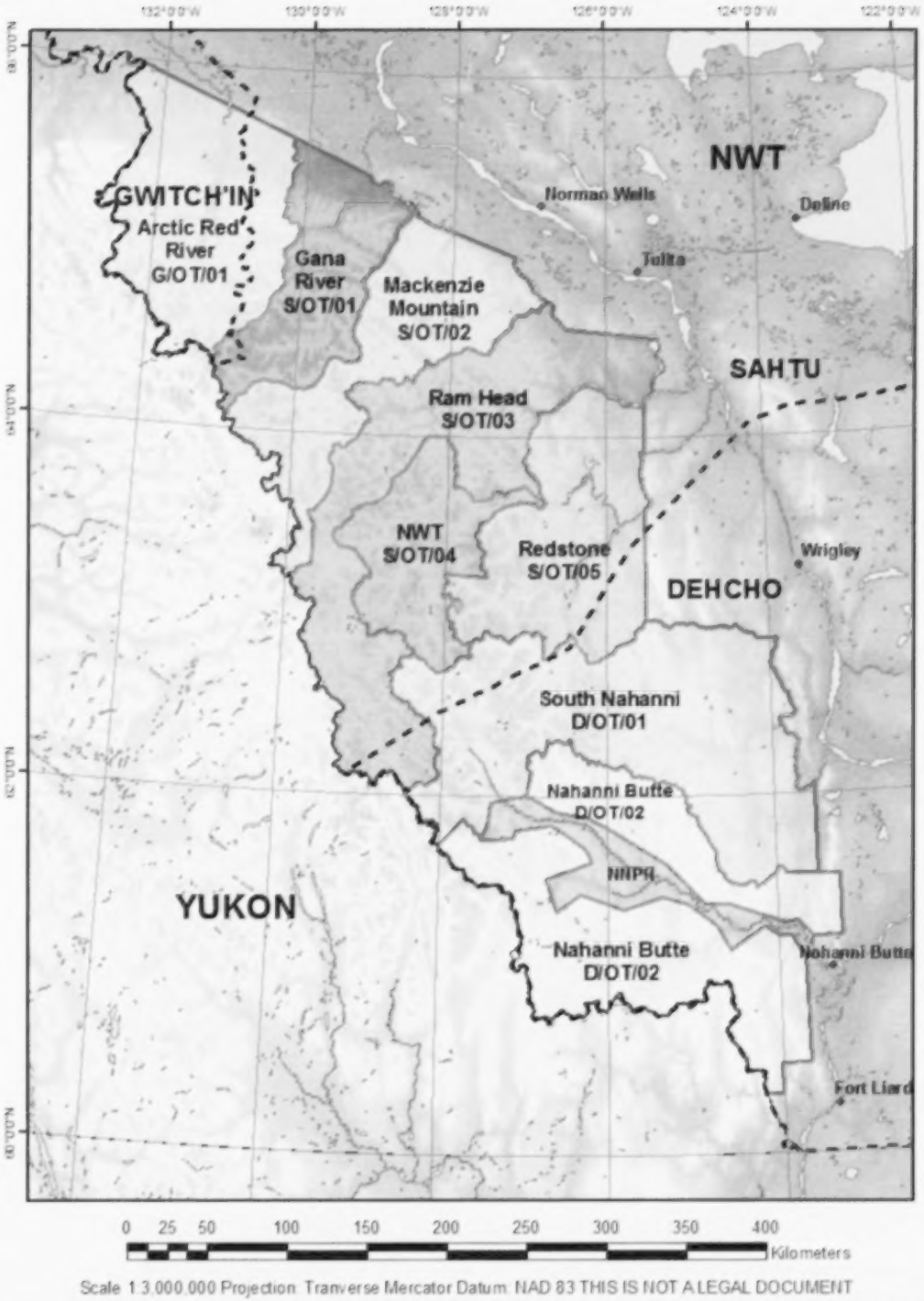

Figure 1. Outfitting zones and land claim areas (dotted lines) of the Mackenzie Mountains, Northwest Territories, with Nahanni National Park Reserve (NNPR) original boundary, prior to 2009 expansion, indicated.

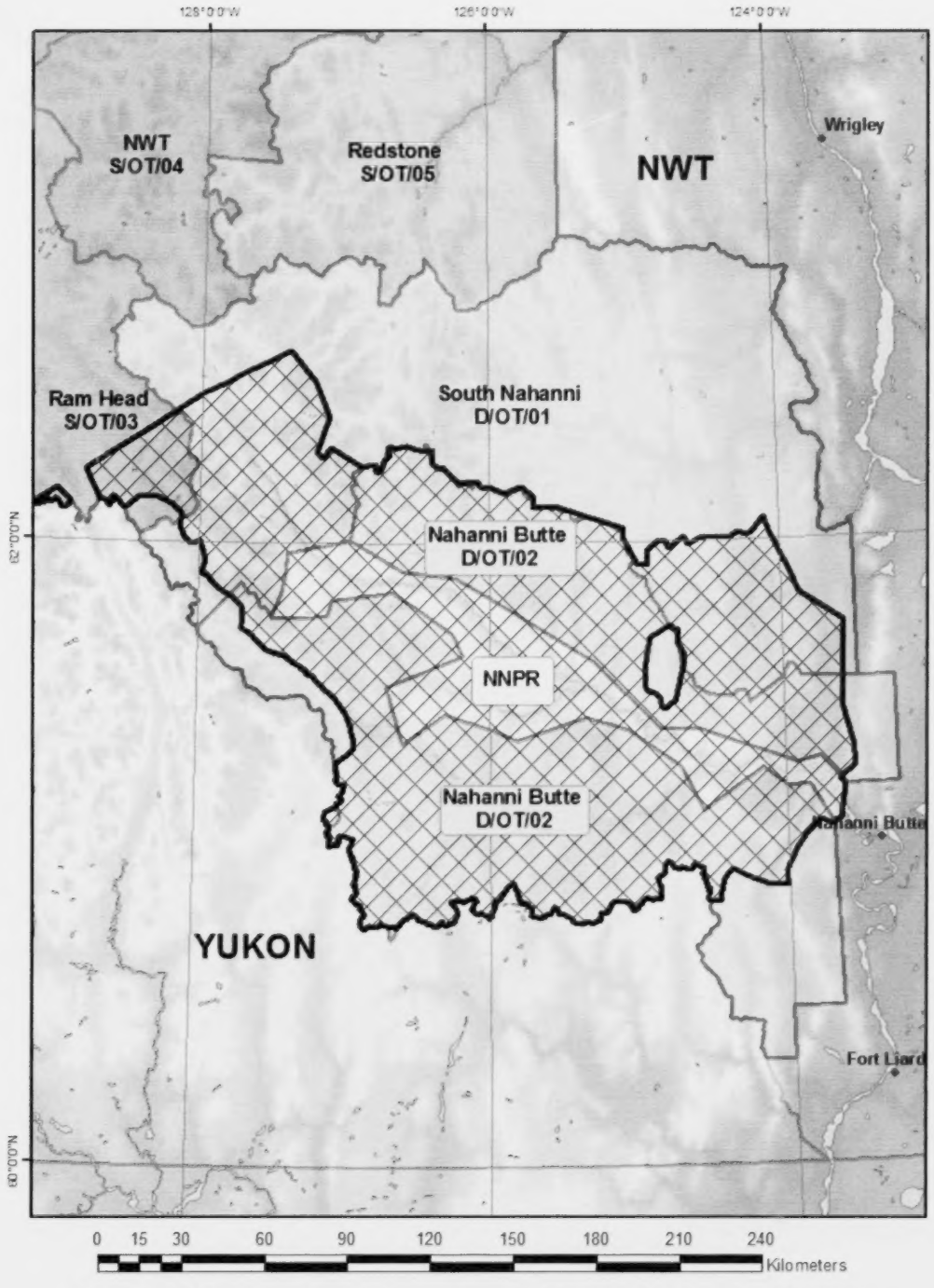

Figure 2. The original boundary of NNPR, in white, with the expanded boundary (9 June 2009) indicated by the checkered polygon.

NT General Hunting Licence (GHL) holders. Under the terms of the NT *Wildlife Act*, each licenced outfitter has the exclusive privilege of providing services within their zone, which enhances the outfitters' ability to practice sustainable harvest through annual allocation of the harvest effort.

The hunting licence year in the NT runs from 01 July to 30 June and those who desire to hunt big game within the NT must annually obtain a big game hunting licence and must be at least 16 years old (Environment and Natural Resources 2011). There are four classes of licenced big game hunters in the NT:

1) *General* - subsistence harvesters, primarily aboriginal people.
2) *Resident* - Canadian citizens or landed immigrants who have been living in the NT for at least two consecutive years prior to application for the licence.
3) *Non-resident* - Canadian citizens or landed immigrants who live outside the NT, or have not resided in the NT for a full two years prior to application for the licence.
4) *Non-resident Alien* - an individual who is neither a NT resident nor a non-resident.

Both non-resident and non-resident alien hunters must use the services of an outfitter and must be accompanied by a licenced guide at all times while hunting big game. For simplification in this report, we call both non-resident and non-resident alien hunting licence holders 'non-residents' and combine their harvest statistics. The data from six resident hunters, who harvested Dall's sheep in the Mackenzie Mountains without a guide, have been included in the number of sheep harvested and the age and horn length measurements in this report as indicated.

Individual non-resident hunters are annually restricted to one each of the following big game species (Appendix B): Dall's sheep (male with at least ¾ curl horns), northern mountain woodland caribou (either sex), moose (either sex), mountain goat (either sex), wolf (either sex)[1], wolverine (either sex), and black bear (adult not accompanied by cub(s)). Although non-resident hunters are allowed to hunt female moose and caribou they prefer to hunt males for their trophy antlers, and the harvest is exclusively males. Non-resident hunting for grizzly bears was closed in 1982 as a result of concerns about over-harvest (Miller *et al.*, 1982; Latour and MacLean, 1994). There are currently no restrictions on the total number of each big game species that an outfitter can take within the zone for which they are licenced.

Wildlife management within the Mackenzie Mountains is the responsibility of a variety of government agencies and boards set up as a result of comprehensive land claim agreements. The Nahanni National Park Reserve (4,766 km^2 original pre-2009 boundary) in the south Mackenzie Mountains is managed by Parks Canada – an agency of the Canadian federal government. Under the terms of the *Sahtu Dene and Metis Comprehensive Land Claim Agreement* (signed in 1993) and the *Gwich'in Comprehensive Land Claim Agreement* (signed in 1992), the main instrument of wildlife management within the two settlement areas lies with the Sahtu Renewable Resources Board (SRRB) and the Gwich'in Renewable Resources Board (GRRB), respectively. Approximately 68,000 km^2 of the central and northern Mackenzie Mountains are within the Sahtu Settlement Area and 8,300 km^2 are within the Gwich'in Settlement Area, which encompass the extreme north end of the range (see Figure 1). However, the GNWT maintains ultimate jurisdiction for management of wildlife and wildlife habitat

[1] In the Sahtu Region non-resident hunters and non-resident alien hunters are allowed to hunt two wolves from 1 August – 15 April.

within each of the claim areas. The Department of Environment and Natural Resources (ENR), GNWT is responsible for licencing outfitters, guides, and hunters and for annually monitoring non-resident big game harvest in the Mackenzie Mountains.

Each year ENR, under provisions in the GNWT's *Wildlife Business Regulations*, requires outfitters to submit an outfitter return on a client hunter success form for each person that purchased a NT non-resident big game hunting licence (Figure 3). These are known as outfitter return forms and they must be submitted whether or not a client actually hunted, and whether or not any game was harvested. The outfitter return forms allow us to quantify harvest by non-resident hunters to help biologists with the GRRB, SRRB, and ENR to ensure that the harvest of each species is within sustainable limits.

In 1995, the then Department of Resources, Wildlife and Economic Development (RWED), requested that all non-resident hunters also fill out a voluntary questionnaire. The questionnaire has evolved through the years based upon suggestions from outfitters, their clients, and government staff. Different questions pertaining to wildlife observations, the quality of the hunting experience, the quality of services related to hunter travel, and specific topics for hunter comment have come and gone. However, one key component of the questionnaire that has remained constant pertains to reporting the different types and numbers of wildlife species seen during their hunts. These data have been recorded and the questionnaire forms have been referred to as hunter observation forms in this report (Figure 4).

Department of Environment and Natural Resources
Pursuant to the *WILDLIFE ACT*

OUTFITTER RETURN
ON CLIENT HUNTER SUCCESS

Ministère de l'Environnement et des Ressources naturelles
En vertu de la *LOI SUR LA FAUNE*

RAPPORT DU POURVOYEUR
SUR LES RÉSULTATS DE CHASSE D'UN CLIENT

OR017556

INSTRUCTIONS: This form is to be completed as soon as possible after the big game animal has been killed and is to be submitted before the 10th day of the following month to the Regional Biologist.
Ce formulaire doit être rempli aussitôt que possible après l'abattage du gros gibier et soit être remis au biologiste régional avant le dixième jour du mois suivant.

OUTFITTER/CLIENT HUNTER - POURVOYEUR/CLIENT CHASSEUR

Outfitter Name - Nom du pourvoyeur: Gana River Outfitters Ltd
Client Hunter Last Name - Nom de famille du client chasseur: Tenn
First Name - Prénom: Michael
U.S. Hunting Lic. No. - N° du permis de chasse des É.-U.: 502205

RETURN FOR THE PERIOD OF - RAPPORT MENSUEL POUR
Month - Mois: August
Year - Année: 2009

BIG GAME HUNTED - GROS GIBIER CHASSÉ (If none killed, complete "No. of Days Hunted" for each species hunted - Si aucun animal n'a été abattu, remplir la partie «Nombre de jours à la chasse» pour chaque espèce chassée)

Species - Espèce	Tag No. N° de l'étiquette	No. of Days Hunted Nombre de jours à la chasse	Guide	Guide Lic. No. N° de licence du guide	Kill Date Date de l'abattage	Latitude	Longitude	Miscellaneous - Divers
Woodland Caribou Caribou des bois	81954							Right Antler Length / Longueur du bois droit: cm; Left Antler Length / Longueur du bois gauche: cm
Moose Orignal								Shovel Antler Spread / Largeur du panache: cm
Mountain Goat Chèvre de montagne								Right Horn Length / Longueur de la corne droite: cm; Left Horn Length / Longueur de la corne gauche: cm; Sex - Sexe
Polar Bear Ours polaire								Hide Length / Longueur de la peau: cm; Hide Condition; Sex - Sexe
Stone's Ground Caribou Caribou de la toundra								Species - Espèce/No. Seen - Quantité aperçue/Sex - Sexe
Other - specify - Autres - spécifier: Wolf	48931							
Other - specify - Autres - spécifier: Wolverine	40849							
Other - specify - Autres - spécifier:								
Other - specify - Autres - spécifier:								
Daily Sheet No./Nº du Dos:	30693	8	Witherell Mark	012556	19 08 64	37 129	41	
	Prg No. - N° de polygon	Cert. No. - N° de cert.	Disc. No. - N° de disque	Right Horn Base Corne droit à la base: cm	Left Horn Base Corne gauche à la base: cm	Horn Length Longueur de la corne: cm	Left Horn Length Longueur de la corne gauche: cm	Spread - Largeur: cm; Broomed - Corne émoussée: Right Droite, Left Gauche; Age

COMMENTS - COMMENTAIRES

We are interested in your observations of quantity and quality of wildlife observed, their location, condition, age, sex, species, etc. In addition, please comment on any unusual conditions (i.e. storm, forest fire, etc.) on the harvested animals.

Nous sommes intéressés par vos observations – concernant tout fait sur la quantité et la qualité de la faune, sa localisation, sa condition, l'âge, le sexe, les espèces, etc. De plus, nous prions faire des commentaires sur les conditions inhabituelles observées sur des animaux récoltés (tempête, conflagration, etc.).

OFFICE USE ONLY / RÉSERVÉ AU BUREAU

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Export Permit Iss. - N° du permis d'exportation:
CITES Permit No. N° du permis CITES:
Checked By - Vérifié par:
Date: 20
Entered By - Inscrit par:
Date: 20

NOTE: This form must be kept up to date and all records relating to the Outfitter Return are subject to inspection by a Wildlife Officer. It is an offence to give false or misleading information in this return.

NOTE: Cette formule doit être tenue à jour. Un agent de la faune a le droit d'examiner tous les documents s'y rapportant. Il est interdit de donner de renseignements faux ou trompeurs sur les formulaires de retour d'un trappeur.

Date: 04092009

Headquarters – Administration Centrale

Figure 3. Example of a completed outfitter return on client hunter success form.

MACKENZIE MOUTAINS, NORTHWEST TERRITORIES
HUNTER WILDLIFE OBSERVATION REPORT – 2007

Dear Hunter: The Department of Environment and Natural Resources request your kind assistance with completing this questionnaire about your NWT hunting experience, in order to assist us with the management of Mackenzie Mountain big game populations. All the requested information is completely voluntary, but your providing it to us is most appreciated.

HUNTER INFORMATION

Last Name	First Name and Initials	
CLIFFORD	GREGORY P.	
Address - number and street, box number	Town, City	Province, State, Country
14 SAGE ROAD	LANDER	WYOMING USA

Hunting License # NL 715052 Outfitter Zone: 6/07/01 Outfitter: ARCTIC RED RIVER

Start Date of Hunt 7/15 2007 End Date of Hunt 7/24 2007 Observations Made Over 10 Days

ESTIMATED NUMBER OF DALL'S SHEEP SEEN			
¾ and Full Curl Rams	Less than ¾ Curl Rams	Ewes	Lambs
25	46	24	17

ESTIMATED NUMBER OF WOODLAND CARIBOU SEEN		
Bulls	Cows	Calves
2	1	1

ESTIMATED NUMBER OF MOOSE SEEN		
Bulls	Cows	Calves
0	0	0

ESTIMATED NUMBER OF MOUNTAIN GOAT SEEN			
Billys	Nannys	Kids	Unknown Age
0	0	0	0

Other Species						
	Wolf	Wolverine	Black Bear		Grizzly Bear	
			Adult	Cub	Adult	Cub
Number(s) Seen	3	0	0	0	1	0

How would you rate you overall hunting experience in the Mackenzie Mountains?
Excellent X Very Good ____ Good ____ Fair ____ Poor ____

How many times have you hunted in the Mackenzie Mountains, **including** this year's hunt? 2

Do you plan to return to hunt in the Mackenzie Mountains again? Yes X No ____

COMMENTS: Excellent Area / outfitter

Thank You! Please give this form to the Officer or Clerk when you are exporting your trophies, or to the guide/outfitter with whom you hunted. We would appreciate receiving this form whether of not you harvested an animal(s).

Figure 4. Example of a fully completed hunter observation report form.

This is the seventeenth consecutive year that a summary of the data collected by ENR on non-resident hunters in the Mackenzie Mountains has been made. In the text of this document, data for 1995 are found in Veitch and Popko (1996), for 1996 in Veitch and Popko (1997), for 1997 in Veitch and Simmons (1998), for 1998 in Veitch *et al.* 2000b, for 1999 and 2000 in Veitch and Simmons (2000; 2002; respectively), for 2001 by Veitch and Simmons (unpublished data), for 2002-2010 in Larter and Allaire (2003; 2004; 2005a; 2006; 2007; 2008; 2009; 2010; 2011 respectively). Additionally, Latour and MacLean (1994) summarized data for 1979 to 1990. This report compiles the harvest data collected during the 2011 hunting season and compares it with available data collected since 1995, and earlier when available.

Nahanni National Park Reserve Expansion

Nahanni National Park Reserve (NNPR), encompassing an area of 4,766 km^2 in the southern Mackenzie Mountains, was originalliy established in 1972, after Prime Minister Pierre Elloit Trudeau canoed down the Nahanni River. The Park was in "reserve" status pending settlement of outstanding aboriginal land claims in the region, which remain ongoing. On 9 June, 2009, the Canadian government, with Dehcho First Nations, announced legislation increasing the area of NNPR to *ca* 30,000 km^2 (11,583 mi^2). This newly enlarged boundary includes 91% of the greater Nahanni ecosystem and most of the South Nahanni River watershed in the Dehcho region (www.pc.gc.ca). The enlarged boundary also overlaps three of the eight outfitting zones which were established in the Mackenzie Mountains in 1965: Ram Head Outfitters (S/OT/03), South Nahanni Outfitters (D/OT/01) and Nahanni Butte Outfitters (D/OT/02). Of the total area of their outfitting zones, 4.7% of the Ramhead zone, 27.2% of the South Nahanni zone

and 79.4% of the Nahanni Butte zone fall within the newly expanded boundary of the NNPR (Table 1).

Table 1. The area (km²) and percent of the outfitting zone that lie within the 2009 expanded boundary of Nahanni National Park Reserve.

Outfitter	Area of outfitting zone	Area of outfitting zone within new NNPR	Percent of zone within new NNPR
Ram Head Outfitters	19,734.82 km²	921.27 km²	4.7 %
South Nahanni Outfitters	25,024.16 km²	6,811.10 km²	27.2 %
Nahanni Butte Outfitters	21,962.30 km²	17,450.66 km²	79.4 %

Parks Canada is currently negotiating with the operators of these outfitting zones in regards to third party interests in the land and land transfer. A tentative ten year time line from the date of the announced expanded boundary has been proposed. Until negotiations have been completed, and the GNWT has been advised of such, it remains business as usual for these outfitters; ENR will continue to issue licences, tags, and export permits for harvesting by these three outfitters in their zones.

The Prairie Creek mine, established in 1966, now falls completely within the newly expanded boundary of NNPR. However, the mine and an area of *ca.* 300 km^2 surrounding the site were specifically excluded from NNPR so that the mine owned by Canadian Zinc was assured of its third party rights to operate and access the mine site. A new bill amending the National Parks Act solely for NNPR was required to assure these third party rights (www.canadianzinc.com).

Share Sale Agreement of Outfitting Zone

Arctic Red River Outfitters (ARRO, G/OT/01) completed a share sale agreement during 2009. ARRO obtained a surrender of rights of first refusal from the Gwich'in Tribal Council as part of the sale requirements. ARRO operates in two settled land claim areas; 78% falls within the Gwich'in land claim area and 22% within the Sahtu land claim area (Figure 1). Rights of first refusal, however, cannot be provided to two different land claim organizations. Five of the eight Mackenzie Mountain Outfitting zones cover more than one land claim area (Table 2). ENR plans on reviewing the big game licencing procedures in regard to this situation for future share sale agreements of outfitting zones.

Table 2. The areas (km^2) and percent of each outfitting zone that fall within different land claim areas. Bold indicates zones found exclusively within one area.

Outfitter Zone	Total Area (km^2)	Dehcho Claim (km^2)	%	Sahtu Claim (km^2)	%	Gwitch'in Claim (km^2)	%
G/OT/01	14,753.70	n/a	0.0	3,207.90	22.0	11,545.80	78.0
S/OT/01	9,272.87	n/a	0.0	9,029.01	97.4	243.86	2.6
S/OT/03	19,734.82	1,247.15	6.3	18,487.67	93.7	n/a	0.0
S/OT/05	14,014.24	1,810.61	12.9	12,203.63	87.1	n/a	0.0
S/OT/02	**12,721.28**	n/a	0.0	**12,721.28**	**100.0**	n/a	0.0
D/OT/01	25,024.16	22,385.62	89.5	2,638.54	10.5	n/a	0.0
S/OT/04	**8,125.57**	n/a	0.0	**8,125.57**	**100.0**	n/a	0.0
D/OT/02	**21,962.30**	**21,962.30**	**100.0**	n/a	0.0	n/a	0.0

METHODS

Prior to the start of the 2011 hunting season, each outfitter in the Mackenzie Mountains received sufficient copies of the outfitter return and hunter observation forms for all their clients for the year. The *Wildlife Business Regulations* requires outfitter return forms to be returned by the tenth day of the month following the month of the hunt – e.g., for a hunter that was in the field in July, a form must be submitted by the 10th of August. Those forms were submitted to the senior biologist in the Dehcho or Sahtu, whether or not a client actually hunted and whether or not harvest occurred. In co-operation with ENR Renewable Resource Officers and the outfitters, persistent attempts were made to obtain outfitter return forms for every non-resident that held a big game hunting licence through a Mackenzie Mountain outfitter in 2011.

Data from both the outfitter return forms and hunter observation forms were entered into Microsoft Excel (Microsoft Corporation, Redmond, WA) spreadsheets. Data were cross-checked with the records of sequentially numbered, unique identifier plugs inserted in the horns of legally harvested rams found in the Licence Information System-IntraNet (LIS-IN) data management system maintained by ENR offices across the NT, and also with GNWT wildlife export permit forms to ensure that all data were verified and the spreadsheets contained all appropriate available data required for analyses.

We distributed new hunter observation forms in 2011 for consistency and recorded all observations directly from these hunter observation forms. If we did not receive a hunter observation form, but wildlife observation data were recorded on the outfitter return form, we used these wildlife observation data. If observation information differed between the hunter observation form and the outfitter return form for the same client we used the data from the hunter observation form. Occasionally we received identical observation

data from forms of different hunters. These hunters had the same guides and lengths of hunts, and obviously had hunted together. We recorded forms with data that had been provided, but for the wildlife observation analyses only one set of observations was used.

All descriptive statistical analyses were performed using Microsoft Excel. We present means ± standard deviation. Some additional statistical analyses were performed using Minitab 7.2 software (Minitab Inc. 1989).

RESULTS AND DISCUSSION

Hunters

Big game hunting licences for the Mackenzie Mountains were bought by 396 non-resident hunters in 2011 (Table 3). This is up from the annual average of 363 licences sold between 1991-2011 (range 321-407) (Figure 5; Appendix F). Of those 396 hunters, 352 came to the NT and spent some time hunting. The remaining 44 either cancelled their hunts, or decided not to hunt for themselves but participated with other hunters they knew, or decided not to hunt due to unforeseen complications after arriving in the NT. Nineteen of the 44 were guides. Guides often purchase licences every year but rarely have the opportunity to hunt themselves.

In 2011, licence sales to non-resident Canadians (n=92) and residents of countries other than the United States (n=62) represented 23% and 13%, respectively, of the number of licences sold (Table 3; Figure 6). The percentage of hunters from the United States has decreased since 2005. Conversely the percentage of hunters from elsewhere in the Americas and Europe has increased. The change in ownership of South Nahanni Outfitters (D/OT/01) has directly resulted in an increased number of European and South American clients. We presume the continued strength of the Canadian dollar is a factor in this change. Guided hunts are marketed in American dollars. A weaker American dollar against foreign currencies makes hunts more attractive to foreign clients, and outfitters realize the need to diversify their clientelle base (Jim Lancaster, personal communication).

Normally, guided hunting in the Mackenzie Mountains occurs from July to October, however successful winter hunting of wolves occurred for the third consecutive season in zone S/OT/01. Two wolves were harvested in April 2012.

Table 3. Province, state and/or country of origin of the 396 non-residents who purchased licences for hunting in the Mackenzie Mountains, 2011.

Canada		United States		Europe		Other	
Yukon	3	Eastern States[1]	98	Spain	6	Mexico	8
British Columbia	41			Germany	14	New Zealand	2
Alberta	42	Western States[2]	144	Austria	5	Phillipines	1
Saskatchewan	2			Hungary	3	Australia	1
Manitoba	0			France	5	South Africa	4
Ontario/ Quebec	4			Belgium	8		
Atlantic Provinces	0			Luxemburg	1		
				Russia	3		
				Denmark	1		
Total	92		242		46		16

[1] AL, AR, CT, DE, FL, GA, IL, IN, IA, KY, LA, ME, MD, MA, MI, MN, MS, MO, NH, NJ, NY, NC, OH, PA, RI, SC, TN, VT, VA, WV, WI
[2] AK, AZ, CA, CO, HI, ID, KS, MT, NE, NV, NM, ND, OK, OR, SD, TX, UT, WA, WY

Table 4. Percent of Mackenzie Mountain outfitter and non-resident hunter forms submitted, 1995-2011.

Form Type	2011	2010	2009	2008	2007	2006	2005	2004
Outfitter Return (mandatory)	99	98	99	99	98	99	100	99
Hunter Observation (voluntary)	62	60	62	71	65	64	65	74

Form Type	2003	2002	2001	2000	1999	1998	1997	1996	1995
Outfitter Return (mandatory)	98	95	92	96	96	97	98	100	98
Hunter Observation (voluntary)	60	59	57	53	51	60	50	71	80

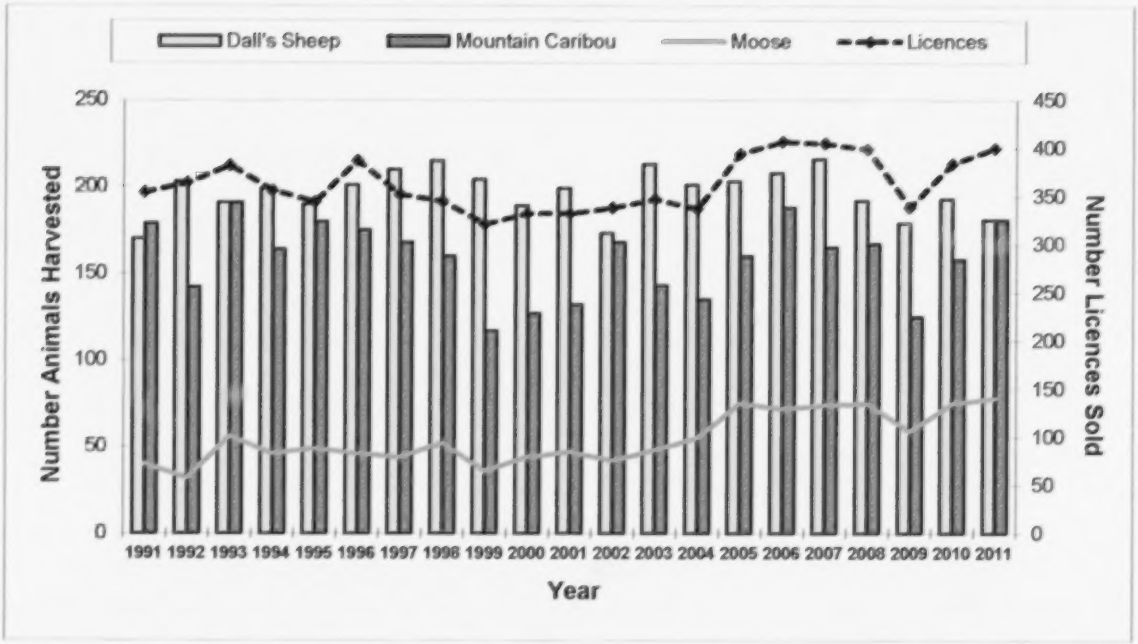

Figure 5. The number of Dall's sheep, mountain caribou, and moose harvested in the Mackenzie Mountains by non-resident hunters, and the number of non-resident licences sold during 1991-2011.

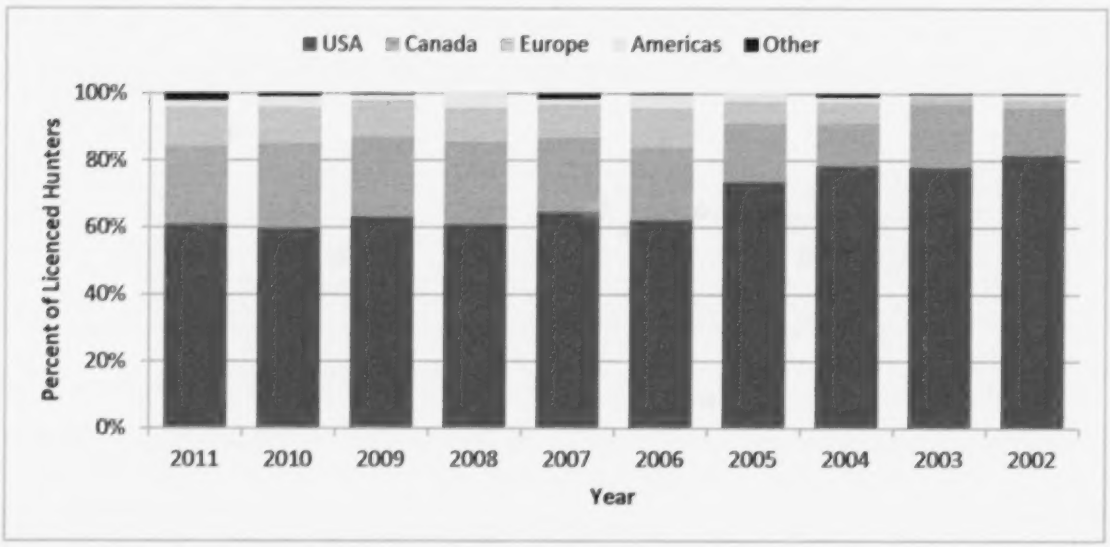

Figure 6. The geographical areas of origin of hunters purchasing licences (in percent) to hunt in the Mackenzie Mountains from 2002-2011.

We received all but three mandatory outfitter return forms for the 396 people that purchased non-resident licences. Voluntary hunter observation report forms were received from 218 (62%) of the 352 that did at least some hunting in 2011 (Table 4). We still struggle to get much more than a 60% return on these forms which is disappointing since there was a consensus by outfitters at the 2003 annual general meeting of the Association of Mackenzie Mountain Outfitters (AMMO) to increase the return of voluntary hunter observation forms. Although most outfitters endeavour to have clients complete and submit these forms, two outfitting zones with fairly large clientele, provided a limited number of returns. We received five of 41 forms (12%) and 25 of 37 forms (37%) from zone S/OT/03 and S/OT/02, respectively. In order to generalize observations over the entire Mackenzie Mountains, representative observations are required from all outfitting zones; these two outfitter zones encompass the greatest range in latitude in the Mackenzie Mountains (Figure 1). See Figure 4 as an example of a fully completed hunter observation form.

It is obvious that non-resident hunters immensely enjoy their hunting experience in the Mackenzie Mountains (Table 5). In 2011, 96% of respondents rated their experience as either excellent (90%) or very good (6%). Not only do voluntary client comments make specific mention of the high quality of hunts (n=95), and the abundance/quality of animals (n=39; Appendices C and D), but many comments make reference to 1) the professional and world class experience with their chosen guides, 2) the abundance of a wide variety of game species and predators, 3) the apparent health and condition of the game animals, 4) the pristine and scenic environment of the Mackenzie Mountains, and 5) compliments on the management and stewardship of the land.

Table 5. Satisfaction ratings for non-resident hunters (including non-hunting guides) in the Mackenzie Mountains, 1996-2011.

Rating	2011	2010	2009	2008	2007	2006	2005	2004
Number of Hunters Reporting	210	193	191	239	239	230	256	229
Excellent (%)	90	88	86	85	81	80	90	84
Very Good (%)	6	10	12	10	12	16	7	10
Good (%)	4	1	2	4	5	3	2	5
Fair (%)	0	1	0	1	2	1	1	0
Poor (%)	0	0	0	0	0	0	0	1
Rating	**2003**	**2002**	**2001**	**2000**	**1999**	**1998**	**1997**	**1996**
Number of Hunters Reporting	191	193	191	158	157	202	144	224
Excellent (%)	82	82	75	76	73	80	78	77
Very Good (%)	15	15	16	17	20	17	17	17
Good (%)	3	3	6	6	5	2	3	2
Fair (%)	0	0	1	0	1	1	1	3
Poor (%)	0	0	1	1	2	0	1	1

Comments about grizzly bears have been common since the start of the voluntary hunter observation forms in 1995; their abundance, problems created around camps and kills, and the lack of, and need for, a grizzly hunting season being consistent themes. This year was no different (Appendices C and D).

In 2000 we started getting comments about high wolf numbers. This continued, but in 2011 we received more comments about wolves stealing meat from spike camps than in previous years.

Similar to last year, we had comments about the expansion of the NNPR, which was announced 9 June 2009. Many questioned the need for such a large expansion,

especially in an area that had been so respectfully managed on a sustainable basis. There were also comments about making a provision for hunting in the expanded area; GHL holders can hunt in the area.

It was the first time hunting in the Mackenzie Mountains for 158 of 210 (75%) respondents (including non-hunting guides). The 49 repeat hunters had hunted from one to 20 times previously. Of 210 respondents (including non-hunting guides) 93% indicated they would like to return to the Mackenzies to hunt in the future.

Prior to the 2009 hunting season ENR worked with Association of Mackenzie Mountain Outfitters (AMMO) to devise a better reporting system for wild game meat use and distribution. What resulted was a supplementary summary meat record form that ENR provided to each outfitter. The new form could be used by itself or with the AMMO meat forms which were voluntarily submitted to ENR. Unfortunately, in the past, AMMO meat forms from outfitters in the Sahtu did not always get turned in and/or forwarded to the Dehcho ENR office. Some outfitters kept the meat forms for their own records in order to have them available for inspection (Kelly Hougen, personal communication). Both forms record the amount of meat (Dall's sheep, northern mountain caribou, moose, and mountain goat) taken from harvested animals and how the meat was used and/or distributed. This year, in addition to the 83 AMMO meat forms submitted, we received summary forms from all eight outfitters. This is the first year we received records of meat distribution from all eight outfitters. ENR will continue to provide supplementry meat forms to all outfitters.

The distribution of wild game meat by outfitters is an important and greatly appreciated local benefit but can often be a topic of heated local debate. We believe that the information on summary meat record forms provides a better overall picture of

the amount of wild game meat being distributed by the outfitters. Meat is used in outfitter camps by guides and clients, is taken out with clients, and is provided to local communities. Generally the majority of meat from harvested Dall's sheep and mountain goats is used in the outfitter camps. Nevertheless, at least 2,029 kg (4,463 pounds) from 173 harvested Dall's sheep and 325 kg (714 pounds) from 18 harvested mountain goats, was distributed locally. Northern mountain caribou and moose meat is also used in outfitter camps, but harvested mountain caribou and moose make up a large portion of the wild game meat that is distributed locally: at least 8,824 kg (19,413 pounds) from 173 northern mountain caribou and at least 13,573 kg (29,860 pounds) from 76 moose. If we use a relatively conservative $25/kg as the replacement cost for meat from local northern retailers, then some $618,750 of meat was distributed locally in 2011.

Dall's Sheep (*Ovis dalli*)

Dall's sheep is one of the most desired species sought by non-resident hunters in the Mackenzie Mountains. Tags to hunt Dall's sheep were purchased by 251 (63%) non-resident hunters in 2011. This is similar to the average number of tags purchased in the past 17 years (Table 6). At least 71% of sheep tag holders (including six resident hunters) pursued Dall's sheep and harvested 181 rams, less than the average 197 sheep harvested in the Mackenzie Mountains (1991-2010) (Figure 5; Appendix F). The mean (± SD) length of a sheep hunt was 4.0 $\pm$ 3.0 days, similar to hunt lengths from 1997 to 2010 (Table 7), but less than the 5.3 day average from 1979-1990 (Latour and MacLean 1994). Outfitted hunts in the Mackenzie Mountains are generally booked for ten days; when hunters fill their sheep tag, any remaining time is typically spent in pursuit of other big game species for which tags are held, or in hunting small game. The

number of hunters taking multispecies hunts has increased in recent years (Jim Lancaster, personal communication; Wener Aschbacher, personal communication).

Harvest by non-residents comprises at least 90% of the total annual harvest of Dall's sheep in the Mackenzie Mountains and takes only 0.9 to 1.6% of the estimated 14,000 to 26,000 Dall's sheep in the Mackenzie Mountains (Veitch *et al.* 2000a). Therefore, the current non-resident harvest level appears well within sustainable limits, provided that hunting pressure is geographically distributed across each of the zones. In the Yukon Territory - where harvest is managed by a full curl rule - thinhorn sheep managers have set the sustainable harvest at 4% of the non-lamb population (Yukon Renewable Resources 1996). In those areas of the Yukon where the management objective is to increase population size, harvest is limited to 2% of the total population.

There has been remarkable consistency in the mean outside contour length of the right horns from rams harvested by non-residents from 1972-2011, mean 89.0 ± 1.7cm (SD) (Appendix E; Table 8), which is surprising given the increase in average age of harvested sheep during that same period. We expected to see more broomed or broken horn tips on older animals, since horn breakage generally occurs as a result of fights between rival males (Geist 1993).

In 2011, of 181 harvested rams, 127 (70%) were ≥10-years-old. The mean age (± SD) of harvested rams was 10.8 ± 1.7 years (range 6.5 to 14.5 years; Table 9). This is the second highest average age of harvested rams recorded in the Mackenzie Mountains since records have been kept (1967) and the 24th consecutive year where the reported mean age of harvested rams was 9.5 years or older (Appendix E). Brooming of 22% of left and 25% of right horns from plugged trophies was considerably lower than the 31% (left) and 32% (right) brooming average over the past 15 years.

Table 6. Tags for big game species purchased by non-resident hunters with outfitters in the Mackenzie Mountains, 1995-2011.

Species	2011 400 hunters		2010 384 hunters		2009 339 hunters		2008 391 hunters		2007 399 hunters		2006 407 hunters		2005 394 hunters		2004 337 hunters	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Dall's Sheep	251	63	253	66	215	63	261	67	266	67	276	68	246	62	229	68
Mountain Caribou	314	79	295	77	252	74	275	70	272	68	274	67	285	72	243	72
Moose	121	30	116	30	96	28	109	28	108	27	112	28	101	26	84	25
Mountain Goat	55	14	45	12	45	13	45	12	50	13	21	5	40	10	24	7
Wolf	285	71	294	77	252	74	228	58	227	57	201	49	214	51	166	49
Wolverine	163	41	171	45	133	39	111	28	150	38	108	27	154	39	89	26
Black Bear	32	8	28	7	22	6	2	1	7	2	3	1	40	10	8	2

Species	2003 347 hunters		2002 329 hunters		2001 339 hunters		2000 332 hunters		1999 321 hunters		1998 345 hunters		1997 352 hunters		1996 387 hunters		1995 343 hunters	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Dall's Sheep	257	74	218	66	220	65	231	70	227	71	246	71	252	72	252	65	218	64
Mountain Caribou	247	71	229	69	201	59	206	62	181	56	223	65	260	74	274	71	233	68
Moose	85	24	68	21	65	19	69	21	63	20	69	20	73	21	74	18	70	20
Mountain Goat	18	5	18	5	12	4	12	4	6	2	23	7	30	8	14	4	16	5
Wolf	207	60	159	48	137	40	155	47	89	28	165	48	209	59	193	50	72	21
Wolverine	141	40	97	29	83	25	85	26	65	20	99	29	135	38	114	30	35	10
Black Bear	9	3	3	1	0	0	6	2	2	<1	2	<1	8	2	0	0	0	0

Table 7. Mean length, standard deviation, and range (in days) of Dall's sheep hunts where at least one day was spent hunting from 1997-2011.

	2011	2010	2009	2008	2007	2006	2005
Number of reports	173	179	179	192	216	214	190
Mean hunt length	4.0	4.0	3.9	3.7	4.1	4.1	4.1
Standard deviation	3.0	3.0	2.6	2.6	2.6	2.7	2.6
Range	1-11	1-13	1-10	1-14	1-13	1-12	1-14
	2004	**2003**	**2002**	**2001**	**2000**	**1999**	**1998**	**1997**
Number of reports	167	189	174	176	198	201	224	216
Mean hunt length	4.0	3.8	4.7	4.8	4.6	4.7	4.4	4.3
Standard deviation	2.9	2.9	2.7	3.0	2.7	3.1	2.8	2.6
Range	1.17	1-12	1-12	1-15	1-15	1-16	1-15	1-12

Table 8. Measurements of Dall's sheep ram horns from sheep harvested by non-resident hunters in the Mackenzie Mountains, 2011.

	Left Horn Contour Length		Right Horn Contour Length		Left Horn Base Circumference		Right Horn Base Circumference		Tip to Tip Spread	
	cm	in	cm	in	cm	in	cm	in	cm	in
Mean	91.0	35.8	90.5	35.6	33.1	13.0	33.1	13.0	58.6	23.1
Std Dev	10.4	4.1	7.8	3.1	1.9	0.3	1.9	0.3	8.4	3.3
Maximum	109.5	43.1	112.4	44.3	37.2	14.6	38.0	15.0	76.0	29.9
Minimum	60.5	23.8	57.0	22.4	27.4	10.8	27.1	10.7	36.0	14.2

The continued high age and consistent brooming reported on harvested trophy sheep may be a result of harvest being spread out in time and space within hunting zones. Exclusivity of non-resident big game harvesting within the each zone provides the opportunity for outfitters to harvest in different parts of their zone on a rotational basis and forgo hunting in some areas for two or three seasons. Also in recent years some outfitters have used helicopters to gain access into areas not accessible by horseback. Because these areas have not been previously hunted this would contribute to spreading out the harvest in space and contribute to the continued high average age of harvested rams.

We calculated an estimated 55.8 lambs per 100 ewes based upon hunter classifications of sheep observed during their hunts in 2011 (Table 10). This is similar to the average ratio of 55 lambs:100 ewes reported since 1995 (Appendix G). For the Richardson Mountains of the northern Yukon and NT, Nagy and Carey (1991) suggest an August ratio of 43 lambs per 100 ewes would have allowed for their observed 10.5% average annual rate of increase from 1986 to 1991. Subsequent to a decline in this unhunted population from 1997-2003, Nagy *et al.* (in prep.) reported 28 lambs per 100 'nursery sheep' in August 2003. Jorgenson (1992) summarized 17 years of lamb:ewe classification data for a population of bighorn sheep in west-central Alberta and found a mean of 43 lambs per 100 ewes in September (range 25 to 54).

Differences in adult sex ratios among populations may result from differences in hunting pressure, differences in survival of males and females from birth to adulthood, or both (Nichols and Bunnell, 1999). However, since the ratio of rams to ewes is almost never equal in wild populations of mountain sheep, even where they are unhunted, it is clear that there is a different natural mortality rate for the two sexes. This difference was

Table 9. Age-structure of Dall's sheep rams harvested by non-resident and resident (n=6) hunters in the Mackenzie Mountains, 1995-2011, based upon counting horn annuli.

Year	Age	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5	16.5	17.5	>10y	%>10	>12y	%>12
1995	No.	0	0	1	4	16	49	51	34	14	14	5	1	0	0	0	68	36.0	20	10.6
	%	0.0	0.0	0.5	2.1	8.5	25.9	27.0	18.0	7.4	7.4	2.6	0.5	0.0	0.0	0.0				
1996	No.	1	0	1	5	21	47	56	36	26	6	1	0	0	0	0	69	34.5	7	3.5
	%	0.5	0.0	0.5	2.5	10.5	23.5	28.0	18.0	13.0	3.0	0.5	0.0	0.0	0.0	0.0				
1997	No.	0	0	0	1	12	39	52	58	24	15	4	2	0	0	0	102	49.5	21	10.1
	%	0.0	0.0	0.0	0.5	5.8	18.8	25.1	28.0	11.6	7.2	1.9	1.0	0.0	0.0	0.0				
1998	No.	0	0	1	4	9	39	45	63	30	12	2	1	1	0	0	109	52.6	16	7.7
	%	0.0	0.0	0.5	2.0	4.3	18.8	21.7	30.4	14.5	5.8	1.0	0.5	0.5	0.0	0.0				
1999	No.	0	0	0	1	13	23	49	47	29	15	6	0	0	0	0	97	53.0	21	11.4
	%	0.0	0.0	0.0	0.5	7.1	12.6	26.8	25.7	15.8	8.2	3.3	0.0	0.0	0.0	0.0				
2000	No.	0	0	0	3	16	39	40	41	28	14	3	3	1	0	0	90	47.9	21	11.2
	%	0.0	0.0	0.0	1.6	8.5	20.8	21.2	21.8	14.9	7.5	1.6	1.6	0.5	0.0	0.0				
2001	No.	0	0	0	4	15	33	41	45	29	11	10	0	0	0	0	95	51.0	21	11.2
	%	0.0	0.0	0.0	2.1	8.0	17.6	21.8	23.9	15.4	5.9	5.3	0.0	0.0	0.0	0.0				
2002	No.	0	0	0	2	6	44	43	39	16	9	6	1	0	0	0	71	42.7	16	9.6
	%	0.0	0.0	0.0	1.2	3.6	26.5	25.9	23.5	9.6	5.4	3.6	0.6	0.0	0.0	0.0				
2003	No.	0	0	1	8	12	43	72	45	11	12	2	3	0	1	0	74	35.2	18	8.6
	%	0.0	0.0	0.5	3.8	5.7	20.5	34.3	21.4	5.2	5.7	1.0	1.4	0.0	0.5	0.0				
2004	No.	0	0	1	3	14	41	49	43	27	16	3	3	0	0	0	92	46.0	22	11.0
	%	0.0	0.0	0.5	1.5	7.0	20.5	24.5	21.5	13.5	8.0	1.5	1.5	0.0	0.0	0.0				
2005	No.	0	1	0	1	11	24	54	47	39	13	5	1	0	0	0	105	53.6	19	9.7
	%	0.0	0.5	0.0	0.5	5.6	12.2	27.6	24.0	19.9	6.6	2.6	0.5	0.0	0.0	0.0				
2006	No.	0	0	0	1	8	26	49	54	36	23	6	1	2	0	0	122	59.2	32	15.5
	%	0.0	0.0	0.0	0.5	3.9	12.6	23.8	26.2	17.5	11.2	2.9	0.5	1.0	0.0	0.0				
2007	No.	0	0	1	2	7	17	33	54	65	19	15	2	1	0	0	156	72.2	37	17.1
	%	0.0	0.0	0.5	0.9	3.2	7.9	15.3	25.0	30.1	8.9	6.9	0.9	0.5	0.0	0.0				
2008	No.	0	0	0	1	4	21	48	53	28	25	7	4	1	0	0	118	61.5	37	19.3
	%	0.0	0.0	0.0	0.5	2.1	11.0	25.0	27.6	14.6	13.0	3.6	2.1	0.5	0.0	0.0				

Year	Age	3.5	4.5	5.5	6.5	7.5	8.5	9.5	10.5	11.5	12.5	13.5	14.5	15.5	16.5	17.5	>10y	%>10	>12y	%>12
2009	No.	0	0	0	0	6	19	26	46	39	23	11	6	1	0	1	127	71.3	42	23.6
	%	0.0	0.0	0.0	0.0	3.4	10.7	14.6	25.8	21.9	12.9	6.1	3.4	0.6	0.0	0.6				
2010	No.	0	0	0	0	3	20	36	53	41	23	13	2	0	0	0	132	68.4	38	19.7
	%	0.0	0.0	0.0	0.0	1.6	10.5	18.8	27.7	21.5	12.0	6.8	1.0	0.0	0.0	0.0				
2011	No.	0	0	0	1	5	22	26	42	40	28	12	5	0	0	0	127	70.2	45	24.9
	%	0.0	0.0	0.0	0.6	2.8	12.2	14.4	23.2	22.1	15.4	6.6	2.8	0.0	0.0	0.0				

Table 10. Observations of Dall's sheep reported by non-resident hunters in the Mackenzie Mountains, 2011.

	Number of Hunters Reporting	Number Observed	Mean Number Observed/hunter	Percent of Sheep Classified
Rams	170	2,979	18.0	37.0
Ewes[1]	153	3,257	21.0	40.4
Lambs	147	1,817	12.0	22.6

[1] includes females >1-yr-old, yearlings, and younger rams. Also called nursery sheep.

believed to be a result of injuries and stress accumulated by males during the breeding season (Geist, 1971).

The 91 ram:100 ewe ratio estimated from hunter observations in 2011 is similar to that reported since 2004 (Appendix G). Since 2004, hunters have generally observed more rams with <¾ curl than rams with >¾ curl. Strong cohorts of juvenile rams may be a factor in the recent higher ram:ewe ratios reported.

In the Yukon, mid to late June annual aerial surveys to count and classify sheep from 1973 to 1998 reported a mean of 48 rams (range 28 to 74) per 100 'nursery sheep' (Jean Carey, Yukon Dept. of Renewable Resources, unpublished data). For the unhunted Richardson Mountains herd (Yukon-Northwest Territories), Nagy *et al.* (in prep.) reported 41 rams per 100 'nursery sheep' in 2003 following a decline from peak population size in 1997. In Alaska, ram:ewe ratio for two unhunted herds in Denali and Gates of the Arctic National Parks typically averaged 60-67:100 (Nichols and Bunnell, 1999). In more heavily hunted Alaskan herds, ram:ewe ratio ranged from 33:100 (heavily hunted) to 87:100 (lightly hunted). The ram:ewe ratios reported for the

Mackenzie Mountains since 1995 (Appendix G) suggest that the harvest of rams in the Mackenzie Mountains is sustainable at current levels.

Table 11. Classification of Dall's sheep rams observed by non-resident hunters in the Mackenzie Mountains, 1995 - 2011.

Ram Class	2011		2010		2009		2008		2007		2006		2005		2004	
	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl
Number of hunters reporting	149	133	158	142	139	132	184	174	150	168	180	171	186	182	188	183
Number of rams classified	1234	1168	1314	1620	1040	1093	1520	1698	1902	2266	1769	2019	1787	1899	2185	2324
Percent of rams classified	51.4	48.6	44.8	55.2	48.8	51.2	47.2	52.8	45.6	54.4	46.7	53.3	48.5	51.5	48.5	51.5
Mean number of rams observed/hunt	8.0	9.0	8.3	11.4	7.5	8.3	8.3	9.8	11.0	13.5	9.9	12.0	9.6	10.4	11.6	12.7

Ram Class	2003		2002		2001		2000		1999		1998		1997		1996		1995	
	Horn > ¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl	Horn >¾ curl	Horn <¾ curl
Number of hunters reporting	127	121	148	133	186	174	151	147	144	138	177	177	205	205	172	174	181	180
Number of rams classified	1662	1654	1720	1720	1812	1765	1351	1717	1579	1756	1848	1924	1538	1586	1713	1699	2070	1645
Percent of rams classified	50.1	49.9	50.0	50.0	50.7	49.3	44.0	56.0	47.3	52.7	49.0	51.0	49.2	50.8	50.2	49.8	55.7	44.3
Mean number of rams observed /hunt	11.9	11.9	11.6	12.9	9.7	10.1	8.9	11.7	11.0	12.7	10.4	11.3	7.5	7.7	10.0	9.8	11.4	9.1

The number of rams classified by curl in 2011 was lower than in most previous years other than 2009 (Table 11). The low number in 2009 was attributed to fewer sheep hunters relative to other years. This was not the case for 2011, as it was closer to the average number of hunters over the past 17 years (Table 6). However, we received fewer observation forms in 2011. In contrast to recent years, hunters observed more legal (>¾ curl) rams (n=1,234) than rams with <¾ curl (n=1,168) in 2011. The mean number of legal rams observed per hunt was 8.0 (Table 11).

Northern Mountain Caribou (*Rangifer tarandus caribou*)

In their 2002 assessment, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated the boreal population of woodland caribou as *Threatened* and the Northern Mountain population of woodland caribou as *Special Concern*. These two populations of woodland caribou were subsequently listed under the federal *Species at Risk Act* in 2004 and 2007 respectively. Caribou of the Mackenzie Mountains are part of the Northern Mountain population of woodland caribou. In order to be more specific and to avoid confusion this report will use "northern mountain caribou" when referring to caribou from the Mackenzie Mountains.

Northern mountain caribou are another of the more desired species sought by non-resident hunters. Tags were purchased by 314 (79%) of non-resident hunters (Table 6), this is the most tags purchased since reporting started in 1991 (average 251; range 181-314). At least 58% of tag holders hunted caribou harvesting 181 males, the third highest harvest from 1991-2011 (Figure 5; Appendix F). The mean (±SD) length of a caribou hunt, determined from the 187 reports where hunters spent at least one day

hunting, was 3.0 ± 2.0 days (range one to 16 days), comparable to that of previous years (Table 12).

We calculated ratios of 44.0 calves and 35.3 bulls (males) per 100 adult females (cows) based upon hunter classifications of northern mountain caribou observed during their hunts. Bulls comprised 19.7% of all caribou classified (Table 13). Both calf:cow ratios and bull:cow ratios are similar to the averages of 44:100 (range 36 - 59:100) and 37:100 (range 21 - 61:100), respectively, calculated since 1995 (Appendix G).

Table 12. Mean length, standard deviation, and range (in days) of northern mountain caribou hunts where at least one day was spent hunting from 2000-2011.

	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000
Number reports	187	175	155	190	172	171	191	120	172	181	178	141
Mean hunt length	3.0	4.0	4.0	3.0	4.0	4.3	3.7	4.9	3.8	3.6	4.3	4.0
Std Dev	2.0	3.0	3.0	3.0	3.2	3.1	3.8	3.9	2.8	2.7	3.2	2.7
Range	1-16	1-14	1-14	1-15	1-16	1-14	1-32	1-34	1-14	1-12	1-15	1-12

Table 13. Observations of northern mountain caribou reported by non-resident hunters in the Mackenzie Mountains, 2011.

Sex/Age Class	Number of Hunters Reporting	Number Observed	Mean Number Observed/hunter	Percent of Total Classified
Bulls	180	4,285	23.8	19.7
Cows	172	12,150	70.6	55.8
Calves	146	5,350	36.6	24.5

In 2011 we received antler lengths from 136 (75%) of successful hunters; a higher percentage than in previous years. Antler measurement information sometimes goes unreported on outfitter forms. This year, as in other years, there was substantial variation in antler lengths, range 71.0-147.6 cm (28.0-58.1 in.). The maximum left and right antler lengths reported were 147.6 and 144.8 cm respectively (Table 14). The maximum antler length recorded by Boone and Crockett for northern mountain woodland caribou in North America is 158.5 cm (62.4 in) for a caribou taken from the Mackenzie Mountains in 1978 (Byers and Bettas, 1999). Eighteen of the top 50 mountain woodland caribou recorded in the 12th edition of the Boone and Crockett Club record book are from the Mackenzie Mountains; the highest scoring antlers hold 6th place (Boone and Crockett Club, on-line trophy database accessed 2011).

Table 14. Antler measurements of northern mountain caribou bulls harvested by non-resident hunters in the Mackenzie Mountains, 2011. All measurements in cm (in).

	Contour Length	
	Left Antler	**Right Antler**
Number Measured	136	136
Mean (cm)	110.6 (43.5)	110.1 (43.3)
Standard Deviation (cm)	49.5 (19.5)	49.1 (19.3)
Maximum (cm)	147.6 (58.1)	144.8 (57.0)
Minimum (cm)	71.0 (28.0)	72.0 (28.3)

Another measuring system for antlered animals is from Safari Club International (SCI), which has a unique all-inclusive record keeping system for measuring trophies, the most used system in the world. Unlike Boone and Crockett this system has no deductions or penalizing for asymmetry. Some outfitters prefer using this measuring

system, especially for caribou, because it provides points for all tines and there are no deductions (Jim Lancaster, personal communication). Eight of the top 20 mountain woodland caribou recorded in the Safari Club International record book are from the Mackenzie Mountains, with a caribou harvested in 2006 holding second place in scoring (Safari Club International, on-line trophy database accessed 2011).

Since 1991 the percentage of bulls observed by clients in the Mackenzie Mountains has never been greater than 28%. This is a lower percentage than the cumulative 39% average adult bull component reported by Bergerud (1978) in his summary of eight North American caribou populations that were either non-hunted or hunted non-selectively (i.e., both males and females included in the harvest). Veitch *et al.* (2000c) classified 2659 of an estimated 5000 caribou in the central Mackenzie Mountains in August 1999 and reported only 25% of those animals were classified as males. Surveys made on the presumed rutting grounds of the South Nahanni caribou population in 1995, 1996, and 1997 reported 24, 28, and 20% of animals classified as males $\geq$1-year-old (Gullickson and Manseau 2000) and in 2001 reported 27% bulls (Gunn *et al.* 2002). A 2007 survey during the rut estimated 33.7 bulls:100 adult cows (R. Farnell and K. Egli, Yukon Territorial Government, unpublished data). A 2008 composition count during the rut in the same general area estimated a slightly higher ratio of 35.5 bulls:100 adult cows (Troy Hegel, personal communication).

Nagy (2011), using movement data from satellite collared northern mountain caribou in the Sahtu (Olsen 2000; 2001) determined ten activity periods. The breeding period, or rut, was defined as 9-25 October. This period was also the activity period with the greatest daily movement rate (Nagy 2011). Hunter observation data are collected

prior to the breeding period and so was the survey in 1999 (Veitch *et al.* 2000c). Surveys conducted well before the rut or breeding period may underestimate the male component of the population. The surveys in 2007 and 2008 were conducted in late September and early October, just prior to the defined breeding period and findings were more comparable to what Bergerud (1978) reported. Based upon hunter observations there is some evidence that the proportion of males differs between populations and that this difference has been consistent over the past 20 years (Larter 2012b). Further investigation is required to explore demographic attributes of northern mountain caribou in the Mackenzie Mountains.

Northern mountain caribou in the Mackenzie Mountains are estimated to number between 13,000 and 18,000 from at least three separate populations shared between the Yukon and Northwest Territories: Bonnet Plume population (5,000 estimated), the greater Redstone population (5 - 10,000 estimated), and the greater Nahanni population (2 - 3,000 estimated) (Environment Canada 2012). They are subjected to an annual bull-selective non-resident harvest of average 158 males per year (1991 - 2011). The resident harvest of northern mountain caribou in the Mackenzie Mountains also tends to be bull-selective (but not restricted to bulls) and is generally light (*ca.* 30 animals/year); subsistence harvest includes both males and females, with the proportion of each dependent on the time of year that animals are harvested (J. Snortland, unpublished data; ENR, unpublished data). Subsistence harvesters in the Mackenzie Mountains include residents of both the NT and Yukon Territory; harvest is not generally reported.

Studies on the Redstone herd of northern mountain caribou were initiated in March 2002, with ten female caribou being equipped with satellite radio collars as part

of a study of caribou in the central and north-central Mackenzie Mountains initiated by the SRRB (Creighton 2006; Olsen 2000; 2001; Olsen *et al.* 2001). A recent analysis of these location data indicates that some of the collared animals in the range of the Redstone herd are relatively sedentary year round, while others show the more typical seasonal migratory movements (John Nagy, personal communication).

Satellite radio collars were deployed on nine adult female caribou during March 2000 and October 2001 by the Yukon Department of the Environment (Jan Adamczewski, personal communication). These animals were believed to be part of the greater Nahanni herd. In October 2004, 18 female caribou were equipped with satellite collars along the Yukon-Northwest Territories border. These caribou were also believed to be from the greater Nahanni herd, but three animals were determined to be from the Finlayson herd. This was a co-operative study between Yukon Territorial Government, Parks Canada (NNPR) and the Wildlife Conservation Society (Weaver 2006). In October 2008, 30 female caribou were equipped with satellite collars along the Yukon-Northwest Territories border. Partners in this project include the Yukon Territorial Government, Parks Canada Agency, Environment and Natural Resources, and the Canadian Parks and Wilderness Society, NWT Chapter (Troy Hegel, personal communication).

Moose (*Alces americanus*)

Tags to hunt moose were purchased by 30% (n=121) of non-resident hunters in 2011 (Table 6). At least 64% of tag holders hunted moose and harvested 78 bulls; the greatest number of moose harvested since reporting started in 1991 (range 32 - 78).

Since 2005, the number of tags purchased and the number of moose harvested has increased (Figure 5; Appendix F). The mean (± SD) length of a moose hunt, determined from the 86 reports where hunters spent at least one day hunting, was 4.1 ± 2.8 days (range one to 14 days), similar to what was reported for previous years (Table 15).

The higher moose harvest starting in 2005 is likely in part related to the change in ownership of outfitting zone D/OT/01. This zone is one of the largest, with an abundance of good moose habitat. Prior to 2005, the annual harvest in this zone was low (<4 moose/year 1991-2004). The majority of clients wanted to hunt Dall's sheep; few were interested in hunting moose. The new owner has a client base which includes a large number of European hunters who are specifically looking for trophy moose for European mounts.

Over the past few years ENR has been collecting, on a voluntary basis, front incisor teeth from moose harvested by hunters in the southern portion of the Mackenzie Mountains. These teeth are forwarded to Matson's Laboratory for aging. Age is determined by counting the cementum annuli much like the growth rings of a tree. June 1 is used as the birth date for moose and caribou (Matson 1981). We currently have aged 99 harvested moose. Their age ranges from 3 to 15 years (mean 7.5 years; median 7.0 years).

Table 15. Mean length, standard deviation, and range (in days) of moose hunts where at least one day was spent hunting from 2000-2011.

	2011	2010	2009	2008	2007
Number reports	86	86	68	82	80
Mean hunt length	4.1	4.5	4.2	3.6	4.0
Standard deviation	2.8	4.0	3.4	2.9	2.5
Range	1-14	1-18	1-14	1-16	1-9

	2006	2005	2004	2003	2002	2001	2000
Number reports	72	85	49	60	46	42	48
Mean hunt length	3.6	4.4	4.8	3.9	3.6	3.7	4.4
Standard deviation	2.7	3.1	3.3	2.8	2.6	2.9	2.7
Range	1-11	1-14	1-12	1-14	1-12	1-12	1-12

The mean (± SD) tip-to-tip spread of measured antlers from bull moose harvested in 2011 was 144.0 ± 21.4 cm (56.7 ± 8.4 in., n=69). This year we received the greatest number of antler measurements (n=69) since records have been kept (Table 16). This year's maximum recorded antler spread was 168.0 cm (66.1 in.), less than the maximum recorded antler spread of 196.9 cm (77.5 in.) for a record moose taken in the NT in 1982. Two moose taken from the Mackenzie Mountains are in the top 20 moose recorded in the record book of the Boone and Crockett Club and hold places 15 and 20; the rest of the top 20 were all taken in Alaska and the Yukon. Another top 25 moose recorded with the Boone and Crockett Club was harvested in the NT in 2008; it was accepted May 2009 and holds 23rd place. A moose harvested during the 2010 season ranks second as a Pope and Young World Record moose with a score of 241 5/8.

Table 16. The yearly mean and range of measured bull moose tip-to-tip antler spread in cm (in).

	2011	2010	2009	2008	2007	2006
Measured (n)	69	65	53	63	62	56
Mean spread	144.0 (56.7)	143.5 (56.5)	143.5 (56.5)	145.5 (57.3)	141.1 (55.6)	141.3 (55.6)
Range	113-168 (44.5-66.1)	106-174 (41.7-68.5)	92-175 (36.2-68.9)	101-174 (39.8-68.5)	102-179 (40.2-70.5)	107-170 (42.1-66.9)

	2005	2004	2003	2002	2001	2000	1999
Measured (n)	53	38	34	32	32	34	26
Mean spread	144.9 (57.0)	150.3 (59.2)	150.0 (59.1)	149.3 (58.8)	144.3 (56.8)	147.0 (57.9)	144.2 (56.8)
Range	122-165 (48.0-65.0)	127-174 (50.0-68.5)	107-165 (42.1-65.0)	103-178 (40.6-65.0)	113-165 (44.5-65.0)	127-179 (50.0-70.5)	109-166 (42.9-65.4)

We calculated ratios of 33.0 calves:100 adult females (cows) and 123.1 bulls:100 cows based upon hunter observations of moose during hunts (Table 17; Appendix G). The calves:100 adult females in 2011 is higher than the average 30:100 calf:cow ratio recorded since 1995 and the eleventh time in the past 17 years when the ratio has been $\geq$30:100. The ratio still remains lower than the 40 - 60:100 that is generally documented during early to mid-winter aerial surveys for moose (*Alces americanus*) along the Mackenzie River in the vicinity of the communities of Fort Good Hope (MacLean 1994a), Norman Wells (Veitch *et al.* 1996), and Tulita (MacLean 1994b) (Appendix G). However, these surveys were conducted after the major fall subsistence harvest and variable female harvest can certainly impact the interpretation of calf:cow ratios. As no

research has been done on moose in the Mackenzie Mountains, we have no explanation for the apparent discrepancy in calf production, survival, or both between the mountains and the river valley. A survey of moose in the Norman Wells study area in January 2001 estimated a calf:cow ratio of 18:100 (ENR Norman Wells, unpublished data), and an aerial survey of the Mackenzie River Valley and vicinity in the Dehcho Region south from the Blackwater River to Jean Marie River conducted in November 2003 estimated 32:100 (Larter 2009). These studies indicate that low calf:cow ratios may not be restricted to the Mackenzie Mountains and that further studies are required to determine the cause(s). A program was established to document calf:cow ratios annually in November in the Mackenzie and Liard River Valleys of the Dehcho (Larter 2009). An aerial survey conducted in November 2011 of the Mackenzie River Valley and vicinity south from the Blackwater River to Jean Marie River estimated 54:100 (N. Larter and D. Allaire, unpublished data).

The bull:cow ratio of 123.1:100 reported for 2011 is higher than the 105:100 average from 1995-2011, but is within the reported range of 76 - 137:100 (Appendix G). Bull:cow ratios from the Mackenzie Mountains continue to be generally higher than the range of 27-105:100 reported in the Yukon (R. Ward cited in Schwartz 1997) and 16:100 from heavily harvested populations in Alaska (Schwartz *et al.* 1992), and average of 46:100 Norway, range (25 - 69:100) (Solberg *et al.* 2002). There has been concern that low bull:cow ratios could influence conception dates, pregnancy rates and newborn sex ratios (Bishop and Rausch 1974; Crête *et al.* 1981; Solberg *et al.* 2002) and that management strategies should maintain a high bull:cow ratio (Bubenik 1972).

Table 17. Observations of moose reported by non-resident hunters in the Mackenzie Mountains, 2011.

Age/Sex class	Number of Hunters Reporting	Number Observed	Mean Number Observed/Hunter	Percent of Total Classified
Bulls	103	459	4.5	48.1
Cows	96	373	3.9	39.1
Calves	57	123	2.2	12.8

Studies on tundra moose in Alaska have not found evidence that moose populations with low bull:cow ratios have reduced reproductive rates (Schwartz *et al.* 1992); populations with a more skewed sex ratio had a relative rate of population increase greater than populations without a skewed sex ratio (Van Ballenberghe 1983). However, a recent study of eight heavily harvested moose populations in Norway indicated a relationship between declining recruitment rate and skewed adult sex ratio (Solberg *et al.* 2002). Based upon hunter observations since 1995, there is no indication of any decreasing trend in the bull:cow ratio of moose in the Mackenzie Mountains, hence the adult sex ratios are an unlikely factor in the low calf:cow ratios reported. The reported sex ratios may have an inherent bias towards a greater number of bulls if harvesters consistently spend more time searching for moose in areas frequented more by large males than females.

Mountain Goat (*Oreamnos americanus*)

Sales of mountain goat tags show more annual fluctuation than any other ungulate species harvested by non-resident hunters in the Mackenzie Mountains, range 6-55 during 1995-2011 (Table 6) with a mean annual harvest of nine goats (range 1 to

21) over the same time (Appendix F). In 2011, mountain goat tags were purchased by 55 (14%) of non-resident hunters, the most purchased since reporting started in 1991. Twenty goats were harvested in 2011; eighteen billies and two nannies. This years' harvest level was similar to that of 2007-2009 (Appendix F). The mean (± SD) length of a goat hunt, determined from the 20 reports where hunters spent at least one day hunting, was 2.3 ± 1.2 days (range one to five days), within the range of what was reported in previous years (Table 18).

Table 18. Mean length, standard deviation, and range (in days) of goat hunts where at least one day was spent hunting from 2000-2011.

	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000
Number reports	20	13	22	21	27	12	18	8	6	4	2	1
Mean hunt length	2.3	3.2	2.5	3.0	2.7	2.8	3.8	3.9	3.0	2.8	1.5	3.0
Standard Deviation	1.2	1.9	2.0	1.8	1.7	1.5	2.8	1.6	2.6	1.9	0.7	n/a
Range	1-5	1-7	1-8	1-8	1-6	2-6	1-14	2-6	1-8	1-5	1-2	3

Mountain goats are known to inhabit five of the eight outfitting zones in the Mackenzie Mountains, occurring almost exclusively below 63° 00' N (Veitch *et al.* 2002). They are most numerous in high relief terrain along the Yukon-Northwest Territories border between 61° 00' and 62° 00' N. However, since 1995 we have received hunter observations or harvest reports of goats from only four of those outfitter zones - D/OT/01, D/OT/02, S/OT/03, and S/OT/04 (see Figure 1). In 2011, observations of mountain goats by hunters came from just two zones, D/OT/01 (n=92), and D/OT/02 (n=151), but goats were harvested from a third zone, S/OT/03. We estimated 64.2 goat kids and 59.4 billies per 100 nannies based upon hunter observations. The goat

kid:nannie ratio was similar to the average 63.4:100 from 2002-2011, while the billie:nannie ratio was lower than the average 64.4:100 from 2002-2011 (Appendix H).

In 2005, we began estimating the age of harvested goats based upon counting horn annuli, and have tried to age as many harvested goats as possible since then. Of the 104 goat (92 billies and twelve nannies) ages we have to date the age range is 2.5 to 15.5 years with 59 aged <8 years, 45 aged >8 years, and 27 animals >10 years (Figure 7). Of the 16 goats (fifteen billies and one nannie) aged in 2011, two were aged >10 years. The longest horns from a mountain goat taken in 2011 were 23.5 cm (left) and 24.0 cm (right). No mountain goats from the NT are listed in the 11th edition of the Boone and Crockett Club record book (Byers and Bettas 1999). Based upon the horn age and length data over the past six years there may be a somewhat linear relationship between age and horn length from 5.5 - 11.5 years, but at ages before or after that there is almost no relationship, implying that large horned animals are found over a wide range in animal ages (Figure 7).

There is some evidence that goat numbers and distribution have been increasing in zone D/OT/02 in the southern Mackenzie Mountains (Larter 2004; Jim and Clay Lancaster, personal communication; Werner Aschbacher, personal communication). The total number of goats observed has been increasing in recent years and billies have been observed in places they had not been seen previously in zone D/OT/02 (Clay Lancaster, personal communication; Appendix H).

In a 2.5 hour rotary-winged survey of zone D/OT/02 on 11 September 2006, 88 goats were observed (38 billies, 27 nannies, 19 goat kids, and 4 yearlings), producing estimates of 140.8 billies and 70.4 goat kids per 100 nannies (N. Larter, unpublished

data). This survey was conducted in an area that could not be surveyed during a 2004 aerial survey and provided similar numbers of goats and ratio estimates as the 110.7 billies and 71.4 kids per 100 nannies from that 2004 survey (Larter 2004). A rotary-winged survey was conducted 22-24 August 2011 in the Ragged Range area of zone D/OT/01, 278 goats were observed (124 billies, 80 nannies, 50 goat kids, 6 yearlings; 18 goats were unclassified), producing estimates of 155.0 billies and 62.5 goat kids per 100 nannies (Larter 2012). These survey results support the contention of increasing goat numbers and distribution. ENR will continue to work with outfitters in zones D/OT/01 and D/OT/02 to better assess the current status of mountain goats in the Mackenzie Mountains.

The increased harvest of mountain goats since 2004 (see Appendix F) may be related to changes in accessibility to the more remote and rugged parts of the various outfitter ranges where goats are resident. The use of rotary aircraft in recent years has permitted outfitters to get into some areas of their zones where they have never been before, areas where goats have been found. This increased accessibility to areas of untouched goat range has likely had some effect on the increased success in goat harvest.

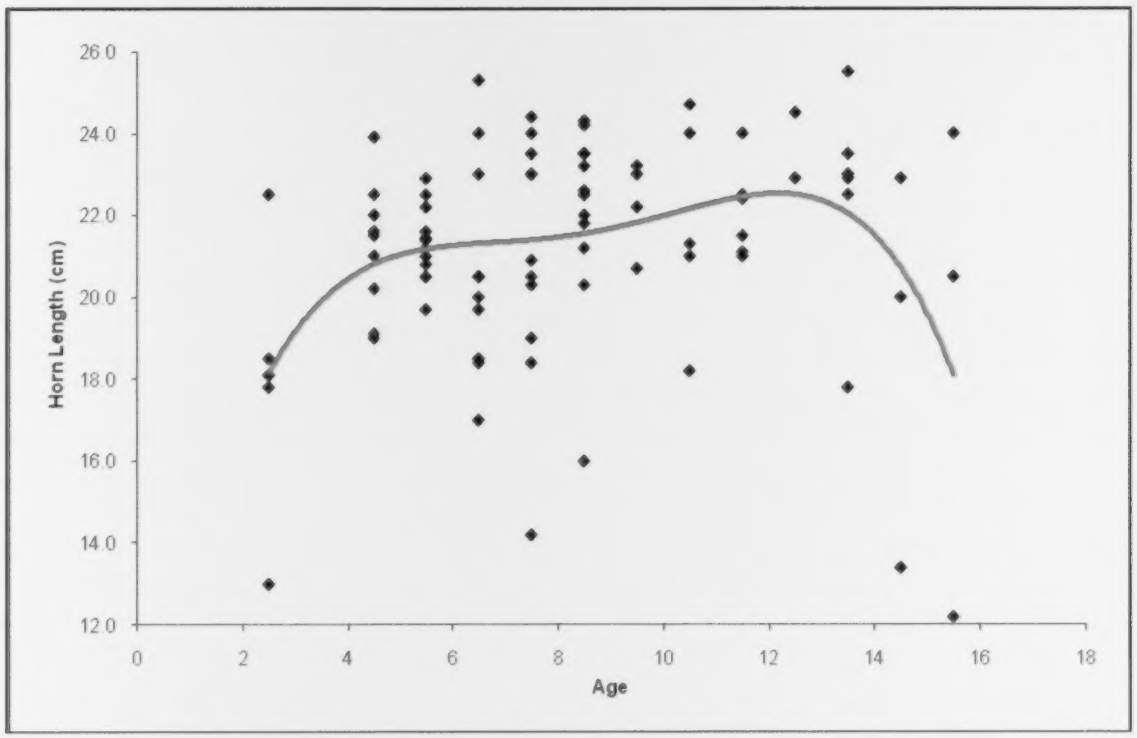

Figure 7. The relationship between the horn length (cm) and age (based upon horn annuli) of 104 mountain goats harvested in the Mackenzie Mountains 2005-2011. Line of best fit is a 4th order polynomial.

Wolf (*Canis lupus*)

Wolf tags were purchased by 71% (n=285) of non-resident hunters in 2011 (Table 6). This is the second highest number of tags and third highest proportion of hunters purchasing tags in any year since the 1995 reporting of observations began (Table 19). At least 16% (n=46) of tag holders actively hunted wolves, with 21 wolves being harvested (seven males, four females and ten unknown sex) (Appendix F). The wolf harvest was higher than the average 14 (range 7-23) from 1991-2010. Hunters reported spending one to 16 days actively hunting wolves (mean ± SD of 3.9 ± 3.2

days). This is the third year that wolves were hunted during the winter; two wolves (both males) were harvested in April 2012 in zone S/OT/01.

The number of wolves observed in 2011 (n=184) falls within the range of observations from previous years. There is no relationship between the number of wolves observed/year and annual harvest nor does the number of tags purchased/year explain annual differences in wolf observations (Table 19). Only 1.9% of responding hunters indicated that they believed wolf numbers were high, generally less than in previous years, and all those comments came from zones G/OT/01 and S/OT/05. The year 2000 was the first year that hunters commented on wolf numbers on the wildlife observation forms. The number of hunters reporting since 2001 has been consistently higher than in previous years, which is attributed to a change in how we defined hunter reporting. For data collected after 2001, we assumed that all returned observation forms where there was a blank, a zero, or a dash in the box indicating the number of wolves observed was a report of no wolves being observed. When looking at the forms this seemed like a reasonable assumption. This assumption may well be invalid for previous years' data and would bias the post 2001 values to be higher than the previous years.

Table 19. Observations of wolves reported by non-resident hunters in the Mackenzie Mountains, the number of wolves harvested and the number of wolf tags purchased, 1995-2011.

	2011[1]	2010[1]	2009[1]	2008[1]	2007[1]	2006[1]	2005[1]	2004[1]
Number hunters reporting	218	203	194	244	244	239	254	244
Number wolves observed	184	203	167	260	262	202	245	317
Number hunters seeing ≥1	74	61	65	76	88	84	76	81
Number harvested	21	19	20	17	12	23	19	18
Number wolf tags	285	294	252	228	227	201	204	166

	2003[1]	2002[1]	2001	2000	1999	1998	1997	1996	1995
Number hunters reporting	203	197	142	116	103	148	141	76	119
Number wolves observed	200	249	215	228	142	148	200	186	269
Number hunters seeing ≥1	74	69	65	61	40	57	76	26	26
Number harvested	12	11	15	14	11	9	17	11	14
Number wolf tags	207	159	137	145	89	165	209	194	72

[1] Change in reporting since 2002 may have resulted in the number of hunters reporting for 1995-2001 being artificially low, see text.

Wolverine (*Gulo gulo*)

Wolverine tags were purchased by 41% (n=163) of non-resident hunters in 2011 (Table 6). This is the second highest number of tags and proportion of hunters purchasing tags in any year since the 1995 reporting of observations began (Table 20). At least 10% (n=17) of tag holders actively hunted wolverine, two wolverines (sex unknown) were harvested in 2011. Hunters reported spending from 1 to 16 days actively hunting wolverine (mean ± SD of 5.1 ± 3.8 days). Hunters reported seeing a group of three, a group of two, and 27 observations of solitary wolverines. Observations were reported from six of the eight outfitter zones this year; most observations came from

D/OT/02 and G/OT/01 (Figure 8). Historically, wolverine observations have been mostly of solitary animals with few family groups being observed. The number of animals observed this year continues an increasing trend from 2007, and is similar to the numbers observed during 1995-1999 and 2004-2006 (Table 20; Figure 8). Wolverine numbers are believed to be declining in other parts of their range in the Northwest Territories (Suzanne Carrière, personal communication); our observations since 1995 in the Mackenzie Mountains are equivocal.

There is no relationship between the number of wolverine observed/year and annual harvest nor does the number of tags purchased/year explain annual differences in wolverine observations (Table 20). Wolverines occur throughout the Mackenzie Mountains, but sightings are considered rare. Most wolverine observations are made in hunting zones G/OT/01, S/OT/01, and S/OT/05.

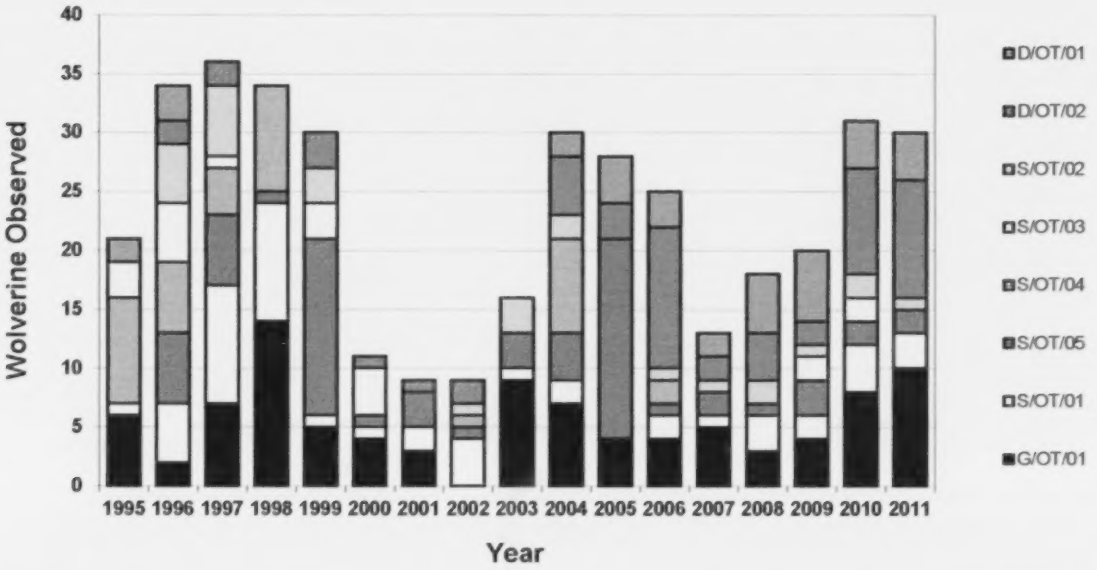

Figure 8. The number of wolverine observed by hunters from 1995-2011 and the outfitter zones where the observations occurred. Data are based upon voluntary hunter observation forms.

Table 20. The number of reported observations of wolverine, the number of wolverine harvested, the number of hunters with wolverine tags, the percentage of total hunters with wolverine tags, and the total number of hunting licences purchased for 1995-2011.

Year	2011	2010	2009	2008	2007	2006	2005	2004
Reported Observed	30	31	20	18	13	25	28	30
Number Harvested	2	3	3	1	0	1	1	0
No. Wolverine Tags	163	171	133	111	150	108	154	89
% Wolverine Tags	41	45	39	28	37	27	39	26
Total Hunting Licences	400	384	339	399	405	407	394	337

Year	2003	2002	2001	2000	1999	1998	1997	1996	1995
Reported Observations	12	9	9	11	30	34	36	34	21
Number Harvested	0	1	2	0	3	0	1	4	1
No. Wolverine Tags	141	97	83	78	65	99	135	114	35
% Wolverine Tags	40	29	26	23	20	29	38	29	11
Total Hunting Licences	347	338	332	332	321	345	352	387	344

Black Bear (*Ursus americanus*)

This year 32 tags were purchased by non-resident hunters for black bears, the second highest number since records have been kept in 1995 (Table 6). This year there was one black bear harvested in the Mackenzie Mountains. Black bears are relatively rarely seen in the Mackenzie Mountains and in most years are reported only from south of 63° 00 N. In 2011, 29 black bears (27 adults and 2 cubs) were reported on returned hunter observation forms (Table 21). Bears were observed in outfitter zones D/OT/01 (4 adults), D/OT/02 (19 adults and 2 cubs), and S/OT/05 (4 adults), with some seen north of 63° 00 N. The number of black bears observed in 2011 falls within the range of 17-56 observed during 2003-2010 (Table 21). As with the other post 2001 carnivore data, we assumed that all returned observation forms where blanks, zeroes, or dashes occurred

in the boxes indicating the number of carnivores observed was a report of no carnivores being observed. This assumption is likely invalid for previous years' data and likely somewhat inflates the post-2001 values relative to 1996-2001 values.

Table 21. Observations of black bears reported by non-resident hunters (including non-hunting guides) in the Mackenzie Mountains, 1995-2011.

	2011[1]		2010[1]		2009[1]		2008[1]		2007[1]		2006[1]		2005[1]		2004[1]	
	Cub	Ad	Cub	Ad	Cub	Ad	Cub	Ad	Cub	Ad	Cub	Ad	Cub	Ad	Cub	Ad
Total # Observed	2	27	0	29	3	14	8	48	4	34	2	27	4	21	1	23
% of Total Observed	7	93	0	100	18	82	14	86	11	89	7	93	16	84	4	96
No. Hunters Reporting	218	218	203	203	194	194	244	244	244	244	239	239	256	256	229	229
No. Hunters Saw at Least 1	2	19	0	8	3	10	3	10	2	17	1	14	3	18	1	19
Maximum # Observed	1	8	0	2	1	3	3	4	2	8	2	11	2	2	1	3

	2003[1]		2002[1]		2001		2000		1999		1998		1997		1996		1995[2]
	Cub	Ad	Cub	Ad	Cub	Ad	Cub	Ad	Cub	Ad	Cub	Ad	Cub	Ad	Cub	Ad	All Bears
Total # Observed	3	34	3	17	0	7	2	15	4	7	0	15	2	3	1	10	11
% of Total Observed	8	92	15	85	0	100	12	88	36	64	0	100	40	60	9	99	nil
No. Hunters Reporting	191	191	199	199	127	130	88	93	87	89	121	124	96	96	6	14	44
No. Hunters Saw at Least 1	2	21	2	14	1	7	1	10	2	6	0	8	2	3	1	9	9
Maximum # Observed	2	7	2	3	0	1	2	3	2	2	0	3	1	1	1	2	2

[1] Change in reporting for 2002 may have resulted in artificially lower numbers of hunters reporting for 1995-2001, see text.

[2] All bears not separated out by cubs and adults.

Grizzly Bear (*Ursus arctos*)

The Mackenzie Mountains have been closed to non-residents for hunting grizzly bears since 1982 and resident hunters have been restricted to one bear per lifetime since the same year (Veitch 1999). It is clear from hunter comments on voluntary observation forms that, despite the lack of hunting opportunities, grizzly bears in the Mackenzie Mountains remain a subject of considerable interest for non-resident hunters and their guides (Appendices C and D). Consistent with the past 13 years, hunters in 2011 reported the loss of meat, capes and food to grizzly bears, commented that there were too many grizzly bears, and that a hunt should be considered. Outfitters also continue to mention camp and equipment damage by grizzly bears both during and after the season. Even though moose calf numbers, based upon hunter observations, are generally lower in the Mackenzie Mountains than those reported in the Mackenzie Valley, and predation by grizzly bears could be a potential cause (Ballard 1992), there were few hunter comments indicating low moose or caribou calf numbers. A frequent comment of guided hunters is that bears have lost their fear of humans because of a lack of hunting and they were concerned that this was a human safety issue. Although there have been no documented injuries from grizzly bear attacks in the Mackenzie Mountains since the closure of the non-resident grizzly bear hunting season (Veitch 1999), there were four incidents in 2011 in the southern Mackenzie Mountains where grizzlies claimed either meat or hides from kills while guides were in the vicinity or while they were at camp. In most instances the grizzlies came at night, took the meat, and left without incident (Carl Lafferty, personal communication). Since 1993 there have been 60 nuisance grizzly bears killed, the majority in the Sahtu (n=37) and Gwich'in (n=14)

regions with 9 in the Dehcho (ENR Norman Wells and Fort Simpson, unpublished data). Three nuisance grizzly bears were killed this year in the Mackenzie Mountains, two in the Sahtu and one in the Dehcho. To minimize human-grizzly bear interactions electric fences have been used at main camps, temporary camp use has been reduced, clean camp policy has become standard, and some known high-use grizzly bear areas have been avoided.

While the mean number of adult grizzly bears observed by hunters has fluctuated around a mean of 300 from 1996-2011, the cub to adult ratio calculated from the hunter observations has shown marked fluctuations, but with limited periodicity (Figure 9; Table 22). There was a peak in 2000, with 40 cubs/100 adult bears observed, followed by a decline to a low of 14 cubs/100 adult bears in 2003. Subsequently there was an increase to 33 cubs/100 adult bears in 2006, followed by a drop in 2007, but with a return to over 30 cubs/100 adult bears for the next two years. In 2011 we report 26 cubs/100 adult bears (Figure 9; Table 22). Because cub grizzlies in the Mackenzie Mountains tend to stay with their mothers for three years (Miller *et al.* 1982), reported observations of 'cubs' likely refers to cubs-of-the-year, yearlings, and two-year-old bears. Miller *et al.* (1982) documented a low reproductive rate for female grizzly bears in the Mackenzie Mountains, with no sows less than eight-years-old producing cubs, an average inter-litter interval of 3.8 years, and a mean litter size of 1.8. The cubs/100 adult bears determined from reported hunter observations during 1996-2011 shows some periodicity, but whether it matches an underlying four year interval is debatable (Figure 9). What is currently happening may or may not be similar to what was reported by

Miller *et al.* (1982) during 1973-1977 when there was non-resident hunting of grizzly bears.

We estimated the mean litter size from hunter observation reports by analyzing just those observations of groups of grizzly bears where cubs were present with only one adult. The estimated mean litter size in 2011 was 1.7, which falls within the range of 1.4 - 2.0 reported from 1996 - 2011. The 1.7 litter size reported for 2011 falls between the mean found by Miller *et al.* (1982) and the 2.2 reported for grizzly bears of Kodiak Island, Alaska (Troyer and Hensel 1964). The demographic parameters of Mackenzie Mountain grizzly bears estimated during 1996-2011 remain generally comparable to those reported during 1973-1977 by Miller *et al.* (1982).

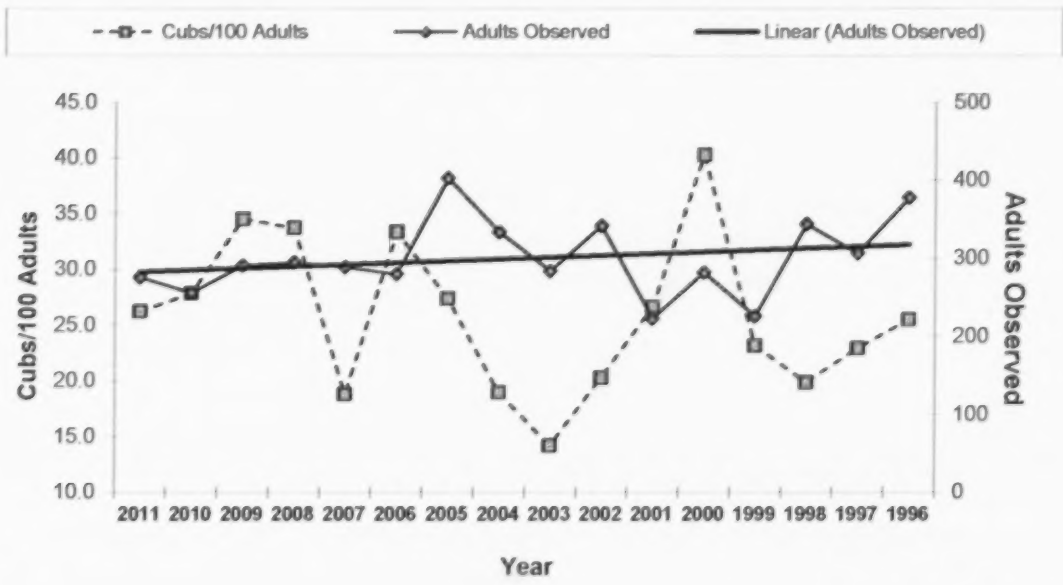

Figure 9. The number of 'cubs'/100 adults and the total number of adult grizzly bears observed by hunters from 1996-2011. Data are based upon voluntary hunter observation forms. The linear trend of total adult bears observed during the same time period is indicated.

Table 22. Observations of grizzly bear reported by non-resident hunters in the Mackenzie Mountains, 1995-2011; total number of bears observed, percent of cubs/adults, number of hunters reporting grizzly observations, number of hunters seeing at least one cub/adult, the mean and maximum number of cub/adults observed.

[1] All bears were not separated out by cubs and adults.

	2011		2010		2009		2008		2007		2006		2005		2004	
	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult
Total # Observed	72	275	71	255	100	290	99	294	54	288	93	279	110	402	63	333
% of Total #	21	79	22	78	26	74	25	75	16	84	25	75	21	79	16	84
# Hunters reporting	38	123	33	104	47	109	48	139	28	127	50	122	49	150	34	131
# Hunters saw ≥1	28	65	25	53	36	64	31	64	17	56	32	70	10	65	15	57
Mean # Observed	1.9	2.2	2.2	2.5	2.1	2.7	2.1	2.1	1.9	2.3	1.9	2.3	2.0	2.3	1.9	2.5
Max. # Observed	4	10	5	11	6	20	6	12	5	15	5	12	10	16	4	15

	2003		2002		2001		2000		1999		1998		1997		1996		1995
	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	Cub	Adult	All Bears[1]
Total # Observed	40	283	69	341	59	222	113	281	52	225	68	343	70	306	96	377	389
% of Total #	12	88	17	83	21	79	29	71	19	81	17	83	19	81	20	80	nil
# Hunters reporting	19	120	34	128	136	171	108	131	98	117	139	177	110	170	49	132	138
# Hunters saw ≥1	9	53	11	48	28	104	51	97	28	81	31	105	32	129	46	129	123
Mean # Observed	2.1	2.4	2	2.7	0.4	1.3	1.1	2.1	0.5	1.9	0.5	1.9	0.6	1.8	2.0	2.9	2.8
Max. # Observed	12	7	8	20	5	10	8	12	4	12	6	16	12	17	5	15	16

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John Nagy provided unpublished data from Richardson Mountain Dall's sheep work and a reanalysis of satellite collared mountain caribou data. We gratefully acknowledge the Boone and Crocket Club for providing us with access to their on-line trophy database and Safari Club International for providing us with caribou data from their on-line trophy database. Matson's Laboratory aged all of the moose teeth.

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Appendix A

Outfitters licenced to provide services to non-resident hunters in the Mackenzie Mountains, NT – 2011.

D/0T/01 – *SOUTH NAHANNI OUTFITTERS LTD.*

Werner and Sunny Aschbacher
PO Box 31119
Whitehorse, YT Y1A 5P7
Ph: (867)-399-3194
Fx: (867)-399-3194
e-mail: info@huntnahanni.com
website : www.huntnahanni.com

D/0T/02 – *NAHANNI BUTTE OUTFITTERS*

Clay and Jim Lancaster
PO Box 3854
Smithers, BC VOJ 2N0
Ph: (250)-846-5309
2nd Ph: (250)-263-9197
e-mail: jladventures@xplornet.com
website:
www.lancasterfamilyhunting.com

G/0T/01 – *ARCTIC RED RIVER OUTFITTERS*

Tavis Molnar
PO Box 1
Whitehorse, YT Y1A 5X9
Ph: (867)-633-4934
Fx: (867)-633-4934
e-mail: arcticred@canada.com
website: www.arcticred-nwt.com

S/0T/01 – *GANA RIVER OUTFITTERS*

Harold Grinde
P.O. Box 528
Rimbey, AB T0C 2J0
Ph: (403)-357-8414
e-mail: ganariver@pentnet.net
website: www.ganariver.com

S/0T/02-*MACKENZIE MOUNTAIN OUTFITTERS*

Stan and Helen Stevens
P.O. Box 175
Dawson Creek, BC V1G 4G3
Ph: (250)-786-5118
Fx: (250)-786-5404
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S/0T/03 – *RAM HEAD OUTFITTERS*

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S/0T/04 - *NWT OUTFITTERS*

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S/0T/05 - *REDSTONE TROPHY HUNTS*

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Appendix B

Summary of fees, bag limits, and seasons for big game species available to non-resident hunters in the Mackenzie Mountains, NT - 2011. [Note: all prices are in Canadian funds.]

Species	Status	Tag Fee	Trophy Fee	Bag Limit	Season
Black Bear	Non-resident	$40.00	$200.00	1 adult bear not accompanied by a cub	15 Aug - 31 Oct 15 Aug – 30 June
	Non-resident alien	$100.00	$200.00		
Woodland Caribou	Non-resident	$40.00	$400.00	1	25 Jul - 31 Oct
	Non-resident alien	$100.00	$400.00		
Mountain Goat	Non-resident	$40.00	$400.00	1	15 Jul - 31 Oct
	Non-resident alien	$100.00	$400.00		
Moose	Non-resident	$40.00	$400.00	1	1 Sep - 31 Oct
	Non-resident alien	$100.00	$400.00		
Dall's Sheep	Non-resident	$40.00	$400.00	1 adult male with min. ¾ curl	15 Jul - 31 Oct
	Non-resident alien	$100.00	$400.00		
Wolf	Non-resident	$40.00	$200.00	1 or 2[2]	25 Jul - 31 May
	Non-resident alien	$100.00	$200.00	2	1 Aug - 15 Apr
Wolverine	Non-resident	$40.00	$200.00	1	25 July - 31 Oct
	Non-resident alien	$100.00	$200.00		25 July - 31 Oct

Source: Department of Environment and Natural Resources. 2011. Northwest Territories Summary of Hunting Regulations. Department of Environment and Natural Resources, Yellowknife, NT. 34 pp.

[2] One wolf limit from D/OT/01-02 and G/OT/01, and 2 wolf limit from S/OT/01-05.

Appendix C

Comments provided from non-resident hunters in the Mackenzie Mountains, NT on voluntary Hunter Wildlife Observation Report forms, 2011. We have not printed actual names of outfitters or their guides (XXX).

Talk to XXX @ XXX for translation.
Very classy operation / great hunting!
XXX + XXX run a first class operation. It is both a privilege and a pleasure to do business with them.
Outfitter was very well organized and guides did wonderful job. Pilots were great. Wonderful experience.
Trip to Mackenzie Mtns. was great. Lots of beautiful scenery and many animals. XXX are very professional and I highly recommend them as an outfitter.
Everything was perfect!
Should allow grizzly bear hunting for non-residents. Largest in NWT record book ram 1734 B+C green score.
Where I try to hunt the caribou, I find nothing in September. I think is nothing about caribou over there. The rest of the animals very good.
Great hunt. Wonderful experience!!!
Great time!!!
I had a great outdoor experience. There are too many bears that are not concerned with people. Goat fell into a cavern and couldn't be retrieved.
Magnificient wild Territories, great hunt.
Very good experience, perfect organization, a lot of wildlife.
Everything was excellent and I will definitely come back.
Great trip, super guide, great food. Thanks for everything.
Just good, shot one horned sheep.
Fantastic area, fantastic people, great hunting, great adventure.
Need to open non-resident hunting for grizzly bear
The outfitter and his team are trying to give their guest a perfect and unforgetable hunt. All is very well organized, XXX and XXX with their staff are a very good and friendly team.
Great adventure + experience with XXX.
Thanks for the memories.
Good hunt, good food, well organized.
Need to open grizzly hunting to non-resident
Highly recommend outfitter to others.
Wolf in top 20 of the world.
All things was good.
Fantastic experience - professional operation - demanding but extremely satisfying hunt. Inaccessibility to this area makes hunting experience very special - area in Park should remain open to hunting as few others would even access the area.
The outfitter is extremely concerned about sheep (ram) management and is selectively harvesting the older rams (approx 10). The guides that worked on the hunt were world class.
First class all the way.
Excellent hunt, great scenery and professional staff.
Great hunt I can't wait to come back!
Awesome!!!
Missed 4 shots
Great hunt. Lots of sheep and great rams.
85 year old hunter/oldest ever for us.
Way better than Alaska
Great experience, great people - very thankful.
Excellent hunt. Beautiful country!
Overall very professional, courteous staff and an abundance of game viewed.
I will be back.
Nice place.

Gret area to hunt!! Lots of game.
Excellent outfitter, professional, outstanding personnel.
Amazing hunt, great guide, great country. Organized outfitter.
Coming back! Do not make it a park.
Awesome outfitter & hunt!
Great experience, guide, outfitters and management.
Beautiful country, top service & guiding. Great numbers of animals. Superb helicopter ride over Nahanni, great hunting experience!!
Hunted as 2 x 1 on sheep then caribou with XXX
Good hunt, thought maybe would see more caribou. Old guy bowhunter shot first bull because he could not walk well. Thus he did not see lots of caribou.
Great numbers + quality of mountain caribou.
First bow killed billy goat in NWT that I know of.
Excellent hunting area, many mature animals throughtout. I'm re-booking soon.
Awesome awesome awesome. I will be back!!!
Good hunting, good outfit. Missed moose + seven shots at bigger older rams ran out of time.
The hunt was the second greatest experience of my life, the first being the birth of my children. To be out in this vast wilderness was an awesome experience. That was topped off in taking a very nice billy goat. The staff at XXX were great.
Excellent hunting with a very professional outiftter. An experience that I will never forget.
Good moose!
High quality
Incredible experience hunting in NWT's Mackenzie Mountains!
Thank you for the excellent experience, the hospitality and the professionalism!
Very good organization, good guides. FANTASTIC NATURE. Good wildlife conservation (conservation minded).
Top organization, very attentive guides, everything's perfect!
Excellent hunting.
A first class hunt all the way.
Keep Nahanni as a multi-use hunting area not just a national park.
Hunted the Yukon back in 2008. Would not return to the Yukon after hunting the NWT w/ XXX. The remoteness that is guaranteed by helicopter access is extremely key to the experience that someone form the states is looking for in a "dream hunt". Would hate to see the expansion of the Nahanni National Park prevent/limit the return of myself and others I know to hunt with XXX Outfitters in the future.
Client wounded ram with bow and did not recover it.
Excellent hunting experience. Excellent Outfitter. Client was a nice guy but was in poor physical condition and could not capitalize on his chances.
Excellent trip! Lots of moose. Wounded bull and could not recover it.
Will return if age permits - great experience with XXX - would pay to hunt grizzly
Would pay good money for grizzly tag
Amazing trip. I saw terrain and animals I hadn't ever expected to see in my life time. I will always remember this adventure for the rest of my life and I hope to be back sometime soon.
Excellent outfitter, very organized, very well ran outfitting business, polite and helpful
Wolf tracks in every draw and on every rock bar, seem to be fairly low ungulate numbers, I sugget aggressive wolf control
The whole experience was great. From the outfitter to the guide (knowledge and experience), to the game harvested and the vastness of the territory in all its beauty. I was truly blessed on this hunt. Ram in good shape, wolf had an empty stomach, grass only.
Great country. Wonderful outfitter.
Very healthy animals
Animals in good condition
Animals in good shape, good lamb crop
Fun, fun, fun, XXX are true professionals!
Healthy animals lots of griz
Animals looked good + healthy lots of caribou
Seen lots of caribou, wolves and griz

Caribou looked good
Healthy animals, lots of caribou
Great experience. There was talk in camp that more hunters are seeing wolves in packs>8 (although we did not see this). I was here to backpack with my son on his Dall's sheep hunt & did not aggressively pursue caribou as his ram was taken last in the trip. Very happy with the result & will need to come back to spend time on caribou.
Would like the chance to hunt grizzly bear. There is a solid population in the area we hunted.
Great hunt - beautiful country - wonderful outfitter + crew
Getting too old, but would like to come back
Had a great time I'll be back again.
I took my Dall's ram on my first full hunting day, so I was not hunting long.
I really enjoyed to see the untouched landscape.
Great experience, beautiful country, great outfitter.
Outfitter was great, it would be nice to be able to get a citties permit for wolves in Norman Wells
Breathtaking!
One of the most memorable, fun, successful hunts ever in what I believe to be the most beautiful hunting area in North America - from the perspective of someone that has hunted/travelled in most US states and nearly every province.
Great experience
First class experience with a first class outfit!
Excellent trip, phenominal outfitter, lots of grizzlies!
Great experience, lots of willdllife, would like to come back in the future.
My 12th year up here and I plan to return
XXX works very hard to follow all provincial regulations and are great stewards of the concession.
I had a great time XXX did a real nice job. XXX (guide) was outstanding. Thank you very much.
Need to start hunting grizzly bears
Prettiest + wildlest land I've ever seen! We'll be back!
Grizzly bear hunting should be allowed in NWT. I saw almost as many different sets of bear tracks as moose tracks. Hunted moose and caribou, had bears in camp on two nights. Heard wolves but never saw them. Had a wonderful hunt in amazing country.
Fantastic hunt & crew! Yet another great experience. Thank you XXX!
Awesome outfitter, awesome quality of game seen. All hunters in camp had a great time.
XXX & XXX runs a 1st class operation. The accomodations in base camp are great. My guide XXX is a professional, ethical young man who gave everything he had to help me get my ram.
Everything excellent, heard many wolves.
Great area, great outfitter.
Guides were great and outfitter was really professional.
XXX is a first class operation - with excellent guides + camp personal awesome trip.
The hunt was first class, everyone could not have been more personable and professional. Camping equipment was outstanding as well as the base camp and food. My guide (XXX) was great and professional and a great hunting companion.
Great outfitter - respecting land and animals - First rate experience!
Beautiful Country! Wonderful hunting and great sheep country. Great people as well.
Great Outfitter - respecting land and animals - true wilderness adventure!
Had bad weather for a lot of the hunt. Great people! Good experience.
Guides were excellent, outfitter is excellent, we just had bad weather for most of the hunt. I would love to return for another hunt.
The outfitter + staff did a great job to ensure success and comfort.
Excellent hunting + fishing, wilderness was just stunning, bull trout to 20 inches, graying to 18 inches.
Lots of game - quality is good
Is definitely the best outfitter with who I have hunted ever.
Very enjoyable hunt. XXX ranks in top ten in hunting experience.
The best hunt ever in the most beautiful mountains I've been to. Pristine wilderness, fantastic animals and great people. I hope to return again in the future.
Outfitter + guides first rate. Excellent job, great people.
Great experience and hunting area! Many quality rams and bulls. The hunting district appears to be very well

managed!

Wonderful country, wonderful people.

Congratulations to XXX from XXX for this so proper game management. Thanks to Canada Government for the opportunity on harvesting Dall sheep ram, so excellent!

Excellent stay in zone 5

The outfitter has a perfect organization and takes only very few trophies per year. So the numbers of animals are high and the quality of trophies is excellent. We will come again for hunting here.

Saw good numbers of sheep, lots of lambs & ewes. Good number of rams, but low numbers of quality. Good quality of caribou bulls with large numbers of cows & calves, no bears or wolves seen by myself. The quantity of animals was good. Quality of caribou looks good, quality of sheep appear to be down from previous years.

Great wild area, keep it that way.

Observed lots of wildlife including Dall's sheep, caribou, ptarmigan, bear & wolves and various other birds. They appeared in good health. Harvested animals had thick, healthy coats and good weight.

Lots of caribou, wolves, sheep seemed low population, all animals in good shape.

Had a great hunt. All class of dall's sheep is very low (older than average). I feel you have low lamb numbers.

Large number of caribou seen once migration started. Large amount of fat on both caribou and sheep indicated good health. Bull/cow and ram/ewe ration's in line with a healthy population. Recruitment numbers good. Wolves took 40lbs of sheep meat.

Nice rams (4) lots of caribou. Bear took 44lbs of sheep meat.

Came from New Zealand, would come again. Lots of numbers.

Saw good numbers of caribou; not a lot of sheep but we did not travel far. Good quality of rams.

I didn't see the number + quality of animals I expected to see in such a vast area. I think more wolves need to be shot + grizzly bear need to have a season. Hunters come to the Mackenzie Mountains to sheep hunt, therefore protecting the number of sheep should be the main focus. I saw numerous caribou, mostly cows + calves. The bulls were of a young age by the size of antler. The sheep numbers were ok with many ewes + lambs. Most of the rams were also young. All together their condition was good.

Outfitter runs a great opertaion. Very professional crew. Saw lots of wildlife of exceptional quality. Saw lots of game of all kinds, Grizzly in camp took a cape and 48lbs of sheep meat. Bears appear to be a big problem. Game quality was excellent - All appear to be very healthy.

As days past the amount of caribou seemed to increase as did the size and quality of the animals.

Lots of quality caribou & sheep.

There seemed to be lots of caribou everywhere I went. Lots of bulls, cows, and calves also seen a few sheep up on the mountains from a long ways away.

The number of caribou seen was decent however the number of mature bulls was much less than anticipated. I saw 3 mature bulls in 3 days, harvested one of them.

Lots and lots of caribou everywhere. Good hunting, lots, lots of great caribou bulls everywhere!

Very good hunt. Accomodations good. Food good. Quality animals. Guides good. I harvested a big record book caribou on the first day of hunt. Am very pleased with animal. Just went into relax mode for remainder of days hunt so did not observe too many other animals.

Great country. Had a great time + seen plenty.

Great people, great friends. Good equipment + livestock. Lots of caribou, too many bears, moose fat + sassy. Wolves took 80lbs of caribou meat.

I had a great 10 days hunting with XXX, good outdoor sights lots of game. The base camp was great sleeping, showers and food, good outside of base camp. Thank you XXX.

Followed blood trail for six hours, deep snow covered tracks the whole next day for 1 mile raking the snow back, went to cross river "lost blood". Used chopper for two hours and also looked for birds, couldn't find.

Good quantity of game and looked to be in good condition.

Nothing unusual noted - overall conditions of wildlife were excellent.

Overall conditions good.

Appendix D

A summary of the 2011 voluntary hunter comments broken down into specific topics.

No. of hunters reporting	No. of hunters mentioning good quality hunts	No. of hunters mentioning abundance /quality of animals	No. of hunters mentioning grizzlies	No. of hunters mentioning wolves	No. of hunters mentioning Park expansion	No. of hunters mentioning bad weather
157	95	39	18	10	4	2

Appendix E

Number, age, and horn length measurements of Dall's sheep rams harvested by non-resident hunters in the Mackenzie Mountains, 1967-2011. Number harvested includes 10[1], 2[2], 6[3], 8[4] and 6[5] harvested by resident hunters.

Year	Number of Sheep Harvested	Age (Years)		Length of Right Horn	
		Mean	Sample Size	Mean (cm)	Sample Size
1967-1968	223	8.4	Unknown	86.4	168
1969	110	-	-	-	-
1970	94	-	-	-	-
1971	88	-	-	-	-
1972	110	8.5	96	86.2	90
1973	89	8.9	86	84.4	88
1974	93	9.2	85	88.6	91
1975	129	7.6	67	84.6	127
1976	144	7.8	46	88.0	144
1977	132	5.7	69	86.8	132
1978	187	8.5	115	88.9	165
1979	200	8.7	108	90.7	159
1980	180	-	-	89.9	127
1981	187	8.1	101	93.7	157
1982	126	8.7	98	89.7	124
1983	100	9.0	80	90.9	94
1984	102	8.4	98	91.2	99
1985	123	8.1	115	89.7	112
1986	154	8.8	132	88.4	153
1987	148	8.9	148	89.4	148
1988	177	9.8	166	91.7	161
1989	207	9.9	199	90.4	203
1990	219	9.8	200	90.2	218
1991	170	9.7	161	89.1	170

Appendix E (cont.)

Number, age, and horn length measurements of Dall's sheep rams harvested by non-resident hunters in the Mackenzie Mountains, 1967-2011. Number harvested includes 10[1], 2[2], 6[3], 8[4] and 6[5] harvested by resident hunters.

Year	Number of Sheep Harvested	Age (Years)		Length of Right Horn	
		Mean	Sample Size	Mean	Sample Size
1992	203	9.7	199	88.0	202
1993	191	9.7	181	87.6	190
1994	199	9.5	191	89.8	196
1995	190	9.7	189	89.3	189
1996	201	9.5	200	88.7	201
1997	210	10.0	206	89.9	203
1998	215	10.0	207	90.0	209
1999	204	10.2	183	88.8	184
2000	189	10.0	189	89.5	189
2001	199	10.0	188	87.7	189
2002	173	9.9	166	89.2	166
2003	213	9.7	210	89.8	212
2004	201 [1]	10.0	199	89.3	200
2005	203 [2]	10.2	196	89.4	199
2006	208 [1]	10.4	206	88.4	207
2007	216 [3]	10.8	216	88.3	216
2008	192 [4]	10.6	192	88.8	192
2009	179 [3]	10.9	178	88.2	178
2010	193 [4]	10.8	191	88.7	192
2011	181 [5]	10.8	181	90.5	181
Mean 1972-2010	173	9.0	155	89.0	166

Appendix F

Outfitted non-resident hunter harvests in the Mackenzie Mountains, 1991-2011. Number harvested includes 10[1], 2[2], 6[3], and 8[4] harvested by resident hunters.

Year	Number of Licences Sold	Number of Animals Harvested						
		Dall's Sheep	Mountain Caribou	Moose	Mountain Goat	Wolf	Wolverine	Black Bear
1991	354	170	179	40	6	14	3	0
1992	364	203	142	32	5	7	0	0
1993	382	191	191	56	9	7	3	0
1994	356	199	164	46	5	15	2	0
1995	344	190	180	49	6	14	1	0
1996	387	201	175	46	4	11	4	0
1997	352	210	168	44	2	17	1	0
1998	345	215	160	52	5	9	0	0
1999	321	204	117	36	1	11	3	0
2000	332	189	127	44	1	14	0	0
2001	332	199	132	47	2	15	2	0
2002	338	173	168	42	5	11	1	0
2003	347	213	143	48	6	12	0	0
2004	337	201 [1]	135	55	6	18	0	0
2005	394	203 [2]	160	75	18	19	1	0
2006	407	208 [1]	188	72	12	23	1	0
2007	405	216 [3]	165	74	21	12	0	0
2008	399	192 [4]	167	75	21	17	1	2
2009	339	179 [3]	125	59	20	20	3	1
2010	384	193 [4]	158	75	13	19	3	0
2011	400	181 [3]	181	78	20	21	2	1
Mean 1991-2011	363	197	158	55	9	15	1	0

Appendix G

Summary of age and sex ratios calculated from non-resident hunter observation reports in the Mackenzie Mountains, 1995-2011.

Year	Dall's Sheep		Mountain Caribou		Moose	
	Lambs: 100 Ewes	Rams: 100 Ewes	Calves: 100 Cows	Bulls: 100 Cows	Calves: 100 Cows	Bulls: 100 Cows
1995	67	82	36	34	30	95
1996	44	82	45	40	26	76
1997	57	55	36	21	30	107
1998	60	84	36	34	30	95
1999	58	90	43	25	20	100
2000	47	90	41	39	26	89
2001	59	89	56	61	28	120
2002	58	89	59	31	29	96
2003	50	83	39	36	25	129
2004	53	93	42	38	30	101
2005	51	98	42	42	33	110
2006	53	96	43	37	33	137
2007	64	83	52	37	36	101
2008	49	98	41	40	31	115
2009	55	94	45	39	31	90
2010	49	93	45	46	35	101
2011	56	91	44	35	33	123
Mean 1995-2011	55	88	44	37	30	105

Appendix H

Summary of age and sex ratios calculated from non-resident hunter observation reports of mountain goats, 2002-2011.

Year	Kids:100 Nannies	Billies:100 Nannies	Total Animals
2002	55.2	75.9	69
2003	61.5	70.5	182
2004	57.1	77.1	84
2005	66.0	50.4	306
2006	61.5	51.4	245
2007	71.2	57.7	393
2008	54.3	97.1	264
2009	64.6	59.0	327
2010	78.3	46.2	239
2011	64.0	59.0	243
Mean	63.4	64.4	235.2